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## COLLEGE OF BUSINESS ADMINISTRATION

### THESIS

# IMPROVING THE SERVICE OF THE BELL SYSTEM SUBSCRIBERS

BY

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(A.B., BOSTON COLLEGE 1924)

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## INTRODUCTION

Since the invention of the telephone by Dr. A. G. Bell the original local companies and later the different larger companies associated into what is now known as the Bell System have had as a motivating spirit the improvement in every possible way of the services which were offered to the public.

At the beginning, the efforts of the different companies were more or less spasmodic, except when they were faced by the competition of other companies in the same localities. But as the different companies became closer associated in a nation wide system, the efforts of the separate companies were unified and directed from a central point, i.e., the American Telephone and Telegraph Company.

This company through the Western Electric Company and the Bell Laboratories has carried on, almost since the beginning, extensive experiments in the technical and engineering features of telephony. Most of these laboratory researches have been published in the daily press or in the technical and scientific magazines and publications.

The American Telephone and Telegraph Company also carries on with the different Associated Companies studies of the ways of improving the management features of the business. These studies take the form of collecting data from all the Associated Companies on the different management and



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ated in a larger system, the efforts were more systematic. In  
fact, the Bell System was organized in 1896, and since that  
time the efforts have been more systematic.

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operating features and of summarizing the data for the use of the officials of each company.

The results of these researches, for the most part, can be found only in the files of the departments concerned in each company and usually cover a period of only one or two years.

This thesis is intended to cover the more salient features of the work which is being done in the Bell System in improving the service of its subscribers in the management features of the business. No attempt has been made, however, to recite all the different steps which it has been necessary to take to bring about these improvements. The thesis deals rather with the efforts made and the results obtained in the more recent years.

I wish to acknowledge the encouragement which was given me by the following men in the New England Telephone and Telegraph Company, and the assistance which they and others gave me in obtaining for me or in lending to me the records which made the writing of this thesis possible.

Mr. W. J. McLaughlin, General Commercial Agent;  
Mr. H. V. Keefe, General Commercial Engineer;  
Mr. J. J. Hartin, Results Supervisor, No. Area-Commercial;  
Mr. J. E. Harrell, General Commercial Manager; and  
Mr. R. C. Marden, Assistant to General Manager.

E. A. Berger  
March 6, 1934.







## Table of Contents

	Page
Introduction	i
Table of Contents	iii
List of Charts in the Bell System	iv
Section I History and Organization	
1. Early History	1
2. Growth	8
3. Present Status in Industrial World	13
4. Organization	15
5. Policy	18
Section II Commercial Department	
1. Organization	20
2. Personnel and Training	23
3. Business Office Operation	34
a. Representation	35
b. Arrangement	41
c. Service Observing	45
1. Service Results	55
d. Customer Relation Activities	60
1. Survey Activities	64
4. Telephone Directories	72
a. Accuracy	73
b. Production and Delivery	76
Section III Traffic Department	80
1. Organization	81
2. Personnel and Training	84
a. Working Conditions	87
b. Supervisory Personnel	92
3. Local Manual Operation	94
a. Accuracy and Completion	99
b. Information Service	109
c. Intercepting Service	113
4. Dial Operation	115
a. Faulty Usage and Equipment Reactions	117
b. Assistance Traffic	120
5. Toll Operation	122
a. Toll Board Operation	126
6. Private Branch Exchange Service	133
a. Organization and Activities	135
b. Service Results	137
Section IV Plant Department	139
1. Organization	140
2. Personnel and Training	143
3. Installation	147
a. Promptness of Installation	148
b. Appointment Plan	153
4. Maintenance and Repairs	157
a. Central Office Plant	159
b. Exchange Outside Plant	163
c. Station Plant	167
5. Accidents	170
Section V Conclusion	174
Section VI References	176







## List of Charts

	Page
1. Telephones in the Bell System	11
2. Organization Chart-Commercial Department	21
3. Business Office Service-Per Cent. of Force Losses	28
4. Business Office Service-Employees with Experience in other departments	29
5. Business Office Representation in Exchanges of less than 25,000 Stations	39
6. Business Office Service-Establishment of Counterless Business Offices	43
7. Business Office Service-Extent of Business Office Service Observing	47
8. Business Office Service-Per Cent. of Contacts Affected by Errors-Telephone	59
9. Business Office Service-Per Cent. of Contacts Affected by Errors-Counter	59
10. Business Office Service-Per Cent. of Contacts Affected by Errors-Correspondence	59
11. Business Office Service-Service Orders-Per Cent. Delivered to Plant Day Application Taken	57
12. Business Office Service-Service Orders-Per Cent. Affected by Errors	57
12a. Directory Service	79
13. Organization Chart-Traffic Department	82
14. Local Traffic Results-Local Traffic Index	98
15. Local Traffic Results-Per Cent. Completed Calls	98
16. Local Traffic Results-Causes of Uncompleted Calls	98
17. Local Traffic Results-Per Cent. of Uncompleted Calls Due to Errors	98
18. Auxiliary Services-Information Service	111
19. Auxiliary Services-Intercepting Service	111
20. Dial Service-Faulty Usage and Equipment Reactions	119
21. Dial Service-Assistance Calls	119
22. Toll Board Service-Toll Traffic Index	125
23. Toll Board Service-Per Cent. of Calls Completed	128
24. Toll Board Service-Speed of Completion	128
25. Toll Board Service-Per Cent. of Errors	131
26. Toll Board Service-Unsatisfactory Transmission	131
27. Organization Chart-Plant Department	142
28. Order Completion Work	156
29. Comparison of Troubles and Subscribers' Reports 100 Stations	162
30. Accident Frequency Rates per 1000 Male Plant Employees	173







## 1. EARLY HISTORY

Most of the inventions of the last century have resulted from a fanciful dream of a writer of fiction or poet. Thus we have the fantasies of a flying carpet conceived by the author of Arabian Nights and the advent of the submarine foretold by Jules Verne; but no one seems to have "conceived of flying conversation". (1) Nor can it truthfully be said that the advent of the telephone was an accident. The particular way in which the first telephone came into existence, no doubt, was accidental, but the theory of transmitting speech telegraphically had been in the mind of Alexander Graham Bell for some time, when in the Spring of 1875, he explained to his assistant, Mr. A. Watson, that any sound could be transmitted by means of a wire "if a current of electricity vary in its intensity, as the air varies in density when a sound is passing through it". (2)

### SECTION I

#### HISTORY AND ORGANIZATION

It was on June 2, 1875 that Bell heard over a wire a faint sound which gave him a presentiment that he was on the eve of solving the problem of sending an undulatory current of electricity. In his visions of the telephone, he had conceived of a "more complex apparatus" than the "extremely simple mechanism", (3) which he was using in trying to perfect the harmonic telegraph. During that summer and the next Winter, the work of perfecting the telephone was "largely a matter of working out the details". (3) It was not, however, until March 10, 1876, that "the first complete and in-

(1) Reference 1, page 202.

(2) Reference 2, page 62.

(3) Reference 3, page 15.





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- (1) Reference 1, page 294
- (2) Reference 2, page 62
- (3) Reference 3, page 15







telligible sentence was transmitted by telephone".(4)

In the summer of 1876 the first telephones were exhibited at the Centennial Exposition at Philadelphia, and although they were "acclaimed as the wonder of wonders" (5) by many of the scientists who were present, they nevertheless received no welcome and no notice from the great business world.(6) During the two years which followed the Centennial Exposition, Bell and Watson devoted most of their time to perfecting telephone instruments and in giving lectures and demonstrations of the use of the telephone. The cost of carrying on these experiments was borne by Thomas Sanders and Gardiner G. Hubbard. But the problem of advancing the necessary money was becoming too heavy a burden for these two men and they urged Bell "to devote the chief part of his time to multiple telegraphy which they then expected would prove of more immediate pecuniary value than the telephone". (7) In order to relieve somewhat the financial tension, Hubbard in 1877 became active in interesting business men in Boston in leasing telephones.

In April 1877 "the first wire line constructed for regular telephone use" (8) was run between Williams' shop on Court Street in Boston and his residence in Somerville. This line, however, was purely experimental. The following month witnessed the first commercial transaction in telephones, when a man named Emery leased two telephones from Hubbard for twenty dollars. In the same month, a young man named E. T.

(4) Reference 2, page 80  
 Reference 6, page 28  
 (5) Reference 1, page 41

(6) Reference 1, page 42  
 (7) Reference 6, page 29  
 (8) Reference 6, page 87







Holmes jokingly suggested to Williams, in whose shops the telephones were manufactured, that "a few telephones be linked to his wires".(9) During the remainder of that year the demand for telephones increased from month to month and by November three thousand telephones had been leased.

These first telephones were all leased on a private line basis, that is, "each person having a telephone could talk to one other telephone and never to any other".(10) Some of the merchants leasing the telephones, however, desired to be able to talk with other merchants also having telephones and it was seen that "the most practical way of providing this interconnection would be to bring the lines from all the telephones to a single point".(11) This led to the development of central offices as we have them today. The first of these central offices was opened in New Haven, Connecticut, in January 1878.

In their activities in leasing telephones, Hubbard and his agents had to compete with the Western Union Telegraph Company. Until then the Western Union had absorbed most of its competitors and virtually had a monopoly in the communications field. It was supplying various kinds of telegraph instruments and the promoters of the telephone found their most fertile field among the users of these telegraph instruments.

The Western Union officials at first refused to see any advantages in the use of the telephone and even declined

(9) Reference 6, page 87

(10) Reference 6, page 88

(11) Reference 6, page 88





an offer to buy the Bell patents; but as they perceived that some of the customers of one of their subsidiaries were leasing telephones to replace the printer telegraphs, they looked around for some method of combating the growing competition of the telephone.

At about this time Edison, in experimenting with the telephone, had developed a carbon transmitter which was superior to the Bell transmitter and he had obtained a patent on it. The Western Union bought the patent rights from Edison, organized the "American Speaking-Telephone Company", and by infringing on the Bell patents entered the telephone field.

Until the organization of this new company, the telephone had been looked upon more or less as a "scientific toy" (12), but this active competition changed its status to an "article of commerce". (12) The organization of a telephone company by the Western Union brought forth many supporters to the aid of Bell and several of Sanders' relatives living near Boston organized a company to do business in New England only, with a capital of \$50,000.

Hubbard now found himself leasing telephones at the rate of a thousand a month. Men, with capital, in other sections of the country obtained agency rights to organize telephone companies in different localities.

The business, however, was becoming too complicated for the men who had first undertaken its promotion. Agents had been appointed in several cities and they had set up





some sort of central office switchboard. These switchboards in most instances had been made locally and there was no uniform system of conducting the business of furnishing telephone service.

The original promoters realized the necessity of establishing some form of standard business organization if the telephone was to continue to increase in popularity and effectively overcome the inroads of the Western Union competition. A law suit had been brought against the Western Union, but this company was so powerful that it looked like an unequal contest. Other companies and individuals also entered the telephone field in violation of the patent rights of Bell. Law suits had to be brought against these infringers also. The extent of this litigation lasted over a period of twenty years, during which time there were "about six hundred suits involving Bell patents".(13)

When the litigation over the telephone patents first started, the promoters of the Bell patents undertook the task of organizing a company on a national scale. In the Fall of 1878, the first Bell Telephone Company was organized with a capital of \$450,000. and was leasing twelve thousand telephones. Less than a year later in the summer of 1879, the company was reorganized into the National Bell Telephone Company with a capital of \$850,000.

One of the first steps taken in adopting a business policy for a national telephone system was to revise the con-





tracts between the Bell Company and its agents, making these contracts good for only five years and confining each agent to one locality. The Bell Company reserved to itself all rights to establish connections between cities and also took steps toward standardizing all the apparatus used in telephonic communication by establishing definite controls over the different factories which made telephone apparatus.

Another incident also occurred in the Fall of 1879 which served to strengthen the position of the National Bell Telephone Company. At the instance of its chief counsel, the Western Union decided "to settle the patent litigations out of court, admit the validity of the Bell patents and retire from the telephone field".(14) An agreement was signed between the two companies with the result that fifty-six thousand telephones were added to the Bell System.

This boom to the Bell Company resulted the following year in a second reorganization and the American Bell Telephone Company was organized with a capital of six million dollars.

Although an attempt had been made to standardize the telephone apparatus, the different companies who were making the apparatus under license agreements were manufacturing equipment which differed greatly in quality. The American Bell Telephone Company definitely settled this difficulty by consolidating six of the manufacturing companies into one company and since then all apparatus has

(14) Reference 6, page 52







been manufactured by the Western Electric Company.

Added to the difficulties which the expanding telephone company was experiencing from the claims of rival contenders of its patents, it was now faced with another problem, that of eliminating the noises on the telephone lines. The early telephones were all operated on a single wire basis, that is there was only one wire from each telephone to the central office, the earth being used to complete the circuit. The telephone company, unfortunately was not the only organization using the earth as a transmitting medium for electric current. The telegraph companies, street railway companies, and electric light companies were also making use of a ground return. There were in addition the natural magnetic lines of force existing in the earth. All of these conditions "caused all manner of strange and uncouth noises on the telephone wires".(15) Although it meant a considerable increase in the costs of furnishing service the telephone companies in 1883 decided that the only possible way to remove "these extraordinary noises from the telephone"(16) was to run two wires from each telephone to the central offices.

(15) Reference 1, page 121

(16) Reference 6, page 34

(18) Reference 1, page 170





## 2. GROWTH

With its first two major problems, that of intensive competition by the Western Union and the "perfect storm of foreign noises", (17) effectively settled, the American Bell Telephone Company now attempted to consolidate or link together all the local telephone companies into a national system.

In 1879 Theodore N. Vail, who was then general manager of the National Bell Company, wrote to one of his assistants that they had "a proposition on foot to connect the different cities for the purpose of personal communication, and in other ways to organize a grand telephonic system".(18)

The plan of connecting the different cities was actively started with the building of a telephone line from Boston to Lowell. This line proved so successful from the start that a line was built from Boston to Providence. At first this line was considered a failure, but after the two-wire or metallic circuit principle was adopted, this line also brought in a profit to its owners and encouraged the heads of the American Bell Telephone Company to build a two-wire line from Boston to New York. The success of this new line removed forever the notion that many persons had, including some of the employees of the telephone company, that the telephone service would always be solely a neighborhood affair.

The success of this line also marked the beginning

(17) Reference 6, page 34  
(18) Reference 1, page 170







of a national telephone system. In order to obtain the necessary money to complete this line, the American Bell Telephone Company "applied to the Massachusetts Legislature -- to authorize an increase" in the capital stock. When this petition was refused the American Bell Telephone Company "organized a company under the laws of New York called the American Telephone and Telegraph Company".(19)

The charter of this new company provided that it was to construct, buy, own, lease or otherwise obtain lines of electric telegraph which would "connect one or more points in each and every city, town or place in the State of New York with one or more points in each and every other city, town or place in said state and in each and every other of the United States, and in Canada and Mexico".(20)

Just as the first twenty years in telephony marked the period of experimentation and development along local exchange lines, so the next ten years marked the expansion of the telephone system into a national system.

No sooner had the Boston - New York line been found successful, than work was started on a line from New York to Philadelphia. This line on completion was extended to Washington. In rapid succession other lines were constructed from New York towards Albany and Buffalo, finally reaching "Chicago in 1892, St. Louis in 1896, Minneapolis in 1897 and Kansas City in 1898".(21)

It was during this decade of expansion also that the telephone wire in cities were first placed underground. The

(19) Reference 6, page 198

(20) Reference 4

(21) Reference 5, page 4





number of wires on poles in the larger cities had become so great that further expansion would have been almost impossible. Local ordinances also were beginning to require that the wires be placed underground.

The eventual solution of the problem of constructing cables which would be as efficient as the aerial open wires greatly accelerated the growth of the telephone system. As it may be seen from Figure 1, on page 11, the growth in the number of telephones during the first twenty years was very small, but with the turn of the century the number of telephones increased each year by hundreds of thousands instead of by thousands.

The growth in the number of telephones in the larger cities also brought about rapid and radical changes in the types of switchboards. The first switchboards were crude affairs, but, as the number of lines increased from a few hundred in each central office to a thousand and ten thousand, the problem had to be solved of bringing all these lines within the smallest possible area. The result of many tests and experiments has been the development of the present multiple switchboards, where one operator may establish connections between any two of 10,500 lines in a central office.

When it had realized the first aim of its charter, that of connecting together the different cities in the United States, and in Canada and Mexico, the American Telephone and Telegraph Company proceeded to fulfill a second aim of its organizers, that of connecting the cities in the North Ameri-





# TELEPHONES IN THE BELL SYSTEM IN MILLIONS

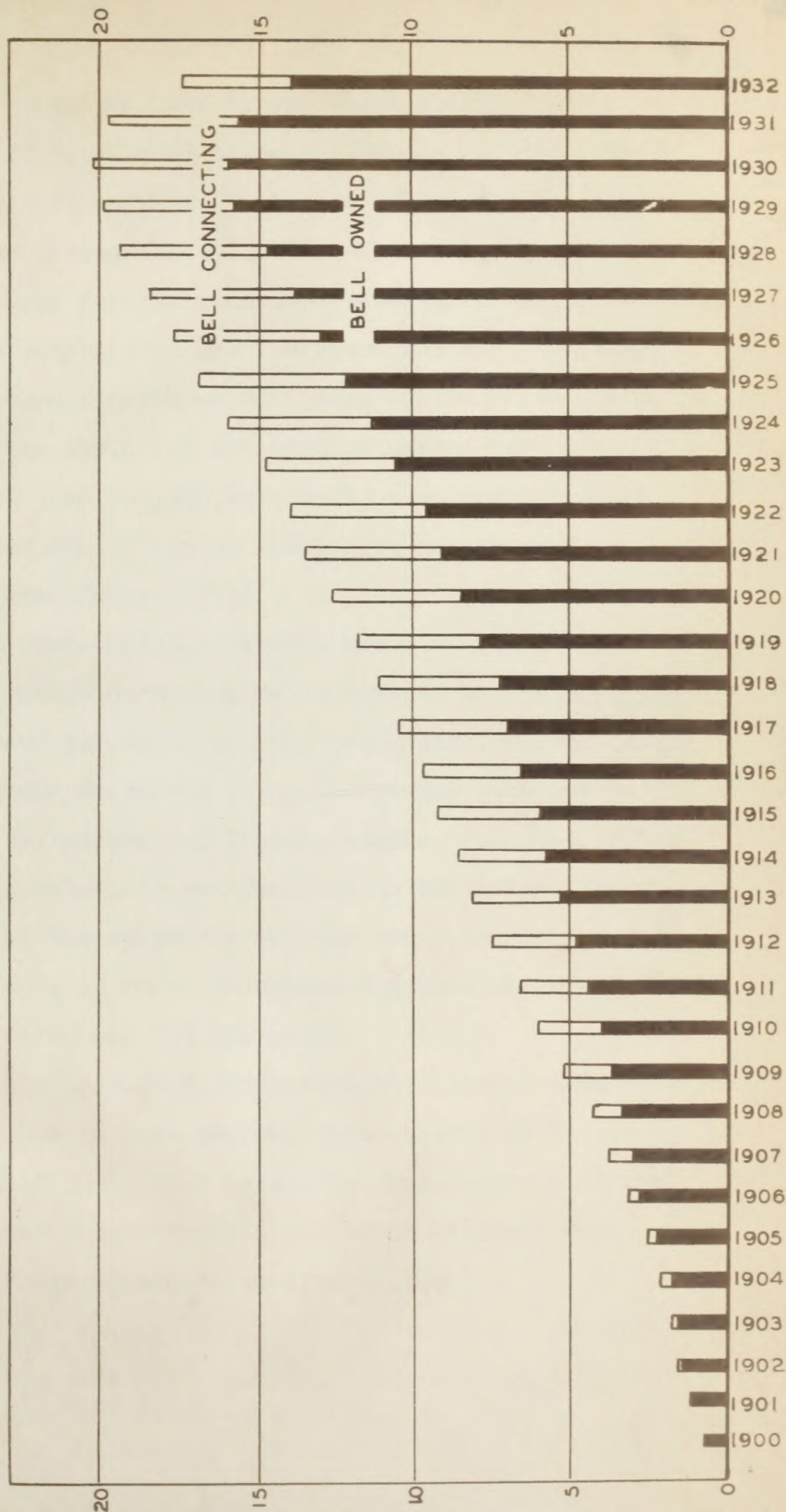


FIGURE I





can continent "with the rest of the known world".(22)

The first step in the establishment of this world wide service was taken in 1927 when transatlantic telephone service was inaugurated between New York and London. Since then the number of foreign countries with which telephone service can be established has increased rapidly. At the end of 1932 "about ninety-two per cent. of the 33,400,000 telephones in the world are now interconnected and all countries with more than 100,000 telephones except New Zealand, Japan, China and Russia can be reached by telephone from any part of the United States".(23)

This trans-oceanic service brought with it the development of ship-to-shore service between nineteen of the larger liners and New York, so that passengers, at sea, may call any telephone connected to or connecting with the Bell System in the United States, Canada, Mexico, and Cuba. This ship-to-shore service, is not confined to the larger liners only, as some of the coastwise vessels and even fishing boats are now equipped with radio-telephones so that the crew may keep in touch with home and business.

The air transport lines also have found it economical and advisable to have two-way radio-telephone service and at the end of 1932, "110 airport ground stations in the United States and a considerable number of aircraft were equipped with radio-telephone equipment".(24)

(22) Reference 4

(23) Reference 7, page 3

(24) Reference 7, page 4





### 3. PRESENT STATUS IN INDUSTRIAL WORLD.

From a corporation which was capitalized in 1876 at one hundred thousand dollars, the Bell System has become in less than fifty years the largest industrial organization in the world, having over 700,000 stockholders. As may be realized from the brief review of its history, its present position was not attained without a considerable amount of competition and opposition, nor without overcoming obstacles which at times seemed insurmountable. In these latter respects, however, the Bell System cannot claim uniqueness; it can, however, maintain without contradiction, that it is one of the very few industries which has attained success without becoming involved in legislative intrigue or financial manipulations. History records innumerable incidents of political bartering in the case of other large corporations, while the highest court in the land has repeatedly reaffirmed the equitableness of the Bell System's financial affairs and intercompany relations and contracts.

Its record in size and financial integrity, however, are not the laurels of which the Bell System is the proudest. It is rather in the efficacy with which it has helped to link the whole nation more closely together that it prides itself.

Before the invention of the telephone, ideas could be interchanged only when the persons were present together or by means of the telegraph or mails. The mails meant a lapse of time and the telegraph necessitated the services of trained operators. The telephone on the other hand can be





used by anyone and time is no longer an element, when we consider that a telephone connection can be established between any two telephones in the United States in a few minutes and sometimes in a fraction of a minute. Thus it is seen that the greatest service which the Bell System has rendered to the American Nation has been the thoroughness with which it has united the country more closely together, commercially and socially, so that a person in the East can be a neighbor to another person in the West by calling him on the telephone. When the present plans of the American Telephone and Telegraph Company have been completed, a citizen of Boston can have as his neighbor anyone else in the world having a telephone within reach.

plaints by the agents of faulty equipment. The National Bell Telephone Company, after signing the agreement with the Western Union Company whereby this latter company agreed "to retire from the telephone business", (25) consolidated these six companies into one company over which it obtained control. This step brought about not only a uniformity of standards and design in telephone manufacturing, but also a concentration of effort in improving the equipment from a service viewpoint and in solving the many engineering problems which were constantly arising.

As the use of the telephone spread over the country there arose the problem of financing the individuals who were given agency rights to lease telephones in different localities. In many instances these agents set up small

(25) Reference 1, page 23





## 4. ORGANIZATION

In arriving at its present status in the industrial world, the Bell System underwent a process of evolution which was more or less forced on it by attending circumstances and the spirit of service and perfection of its personnel.

During the first few years, all telephone apparatus was manufactured by a Mr. Williams in Boston. As the demand for telephones increased, Williams was not able to fill all the orders for telephone apparatus and five other manufacturers were given orders to make telephone apparatus under a license agreement. This arrangement did not prove very satisfactory as the equipment was not of a uniform standard and there were many complaints by the agents of faulty equipment. The National Bell Telephone Company, after signing the agreement with the Western Union Company whereby this latter company agreed "to retire from the telephone business", (25) consolidated these six companies into one company over which it obtained control. This step brought about not only a uniformity of standards and design in telephone manufacturing, but also a concentration of effort in improving the equipment from a service viewpoint and in solving the many engineering problems which were constantly arising.

As the use of the telephone spread over the country there arose the problem of financing the individuals who were given agency rights to lease telephones in different localities. In many instances these agents set up small





local companies and issued stock. For many years, these small companies were not very profitable, could not pay dividends and would have been hard pressed if they had been required to pay for the agency rights in money. To help these small companies, the agency contracts with the National Bell Telephone Company provided that payment could be made in stock.

Later as the American Telephone and Telegraph Company was organized to interconnect these different small companies and when it had taken over the National Bell Telephone Company, it helped the small local companies to consolidate into larger companies embracing a whole state or a group of neighboring states. These companies are now known in the Bell System as Associated Companies. It may thus be seen that the Bell System is not a corporate unit but a unit made up of several independent corporations associated together to furnish telephone service to the nation.

In the Bell System the American Telephone and Telegraph Company, or the American Company as it is more popularly called by telephone men, coordinates the activities of all the other companies into a system having a common policy. In a sense the American Company is not an operating company in that it does not furnish local service to any subscribers. Through its Long Lines Department, it maintains telephone lines between the different Associated Companies and in some instances it does the operating on these inter-company lines.

The Associated Companies, on the other hand, are op-







erating companies and furnish local and toll service within definite territories under License Agreements with the American Company. The Associated Companies also assist in establishing connections between its own subscribers and subscribers of another Associated Company. There are a large number of these Associated Companies in the sense of separate corporations, but they are usually grouped into twenty-four for general administrative purposes.

The plan of organization within each Associated Company is quite uniform due to the nature of the business of each company. Thus we have in each company "organization branches dealing with such specialized functions as legal, accounting and financial, and engineering matters", (26) which branches of organization are more or less common to every large corporation. The majority of the employees of each company, however, are engaged in commercial, plant or traffic functions. In the following sections of this thesis, some of the functions in these three departments will be treated more in detail, along with a study of some of the improvements which have been realized in furnishing a better service to telephone subscribers.

Another incident which had a bearing in the unification of the different companies into a national system

(26) Reference 5, page 22





## 5. POLICY

The fact that telephones today are leased instead of being sold outright is more or less accidental. When Bell had succeeded in perfecting a telephone which would reproduce complete sentences, the two men who were advancing the necessary money to carry on the work of experimentation had about reached the point where they could not carry the burden any longer. They had even advised Bell to concentrate his efforts on perfecting the harmonic telegraph as this gave promises of a richer reward.

The fortunate presence of Dom Pedro, Emperor of Brazil, at the Centennial Exposition in Philadelphia and, still more, the fact that he recognized Bell whom he had met some years previously at Boston University, brought the telephone to the notice of the greatest scientists of that period. It also brought to the telephone and to Bell sufficient newspaper publicity that many wanted to see and hear this "speaking telegraph" as it was first called.

After the Exposition, Bell gave many lectures and demonstrations of the use of the telephone and the revenue which he received from these lectures enabled him, in part, to continue the work of perfecting the telephone. Later when the demand arose for telephones, it was found possible to lease them instead of selling them outright; a condition without which a national telephone system would be impossible.

Another incident which has had a bearing in the unification of the different companies into a national system





was the provision in the agency contracts, restricting the agents to furnishing telephone service in local areas only. It thus enabled the parent organization later to connect these separate companies so as to obtain a uniformity of service and policy.

Although the Bell System today enjoys a virtual monopoly in its own field, the management of the Bell System has accepted the responsibility of adopting a policy which does not make this monopoly objectionable. This policy of the Bell System was clearly stated by President Gifford of the American Telephone and Telegraph Company before the 1927 Convention of the National Association of Railroad and Utilities Commissioners at Dallas, Texas.

After stating how widespread the ownership of the Bell System was, and the necessity of maintaining sufficient earnings to assure adequate telephone service and the necessary financing when it was needed, President Gifford spoke of the inherent competition in the business where improvement in service was the keynote of the System and summed up his address by stating:

"We shall continue to go forward, providing a telephone service for the nation more and more free from imperfections, errors, or delays, and always at a cost as low as is consistent with financial safety".(27)

In the next three sections a review will be made of some of the activities in the Bell System in freeing the telephone service "from imperfections, errors, or delays."  
(27) Reference 5, page 12





## 2. ORGANIZATION

The Commercial Department has the direct function of establishing all business contacts with the public and is charged with the responsibilities of maintaining good public relations between the Company and the public. Its activities are varied but they may be grouped under the three general headings of Sales, Service, and Engineering and Development.

The work of the Commercial Department is carried on mostly through the business offices which are maintained in almost every local exchange area. In the larger cities these offices are in charge of a Commercial Manager, while in the smaller cities the commercial work is performed by a representative or agent who reports to the Commercial Manager of a neighboring exchange. The Commercial Manager represents the Company in his area in executing all contracts with the public for telephone service and reports to a District Manager, who in turn reports to a Division Manager. The Division Managers report to the General Commercial Manager. The chart on page 21 shows the organization plan in part of the Associated Companies.

### SECTION II

#### COMMERCIAL DEPARTMENT

The local Commercial Managers are charged primarily with the sales and service functions of the Commercial Department, and in the following pages a review will be made of the more important activities connected with these two functions.

The work of Engineering and Development is done mostly in the general offices of the company, and although





## 1. ORGANIZATION

The Commercial Department has the direct function of establishing all business contacts with the public and is charged with the responsibilities of maintaining good public relations between the Company and the public. Its activities are varied but they may be grouped under the three general headings of Sales, Service, and Engineering and Development.

The work of the Commercial Department is carried on mostly through the business offices which are maintained in almost every local exchange area. In the larger cities these offices are in charge of a Commercial Manager, while in the smaller cities the commercial work is performed by a representative or agent who reports to the Commercial Manager of a neighboring exchange. The Commercial Manager represents the Company in his area in executing all contracts with the public for telephone service and reports to a District Manager, who in turn reports to a Division Manager. The Division Managers report to the General Commercial Manager. The chart on page 21 shows the organization plan in most of the Associated Companies.

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The work of Engineering and Development is done mostly in the general offices of the company, and although





# ORGANIZATION CHART

## COMMERCIAL DEPARTMENT

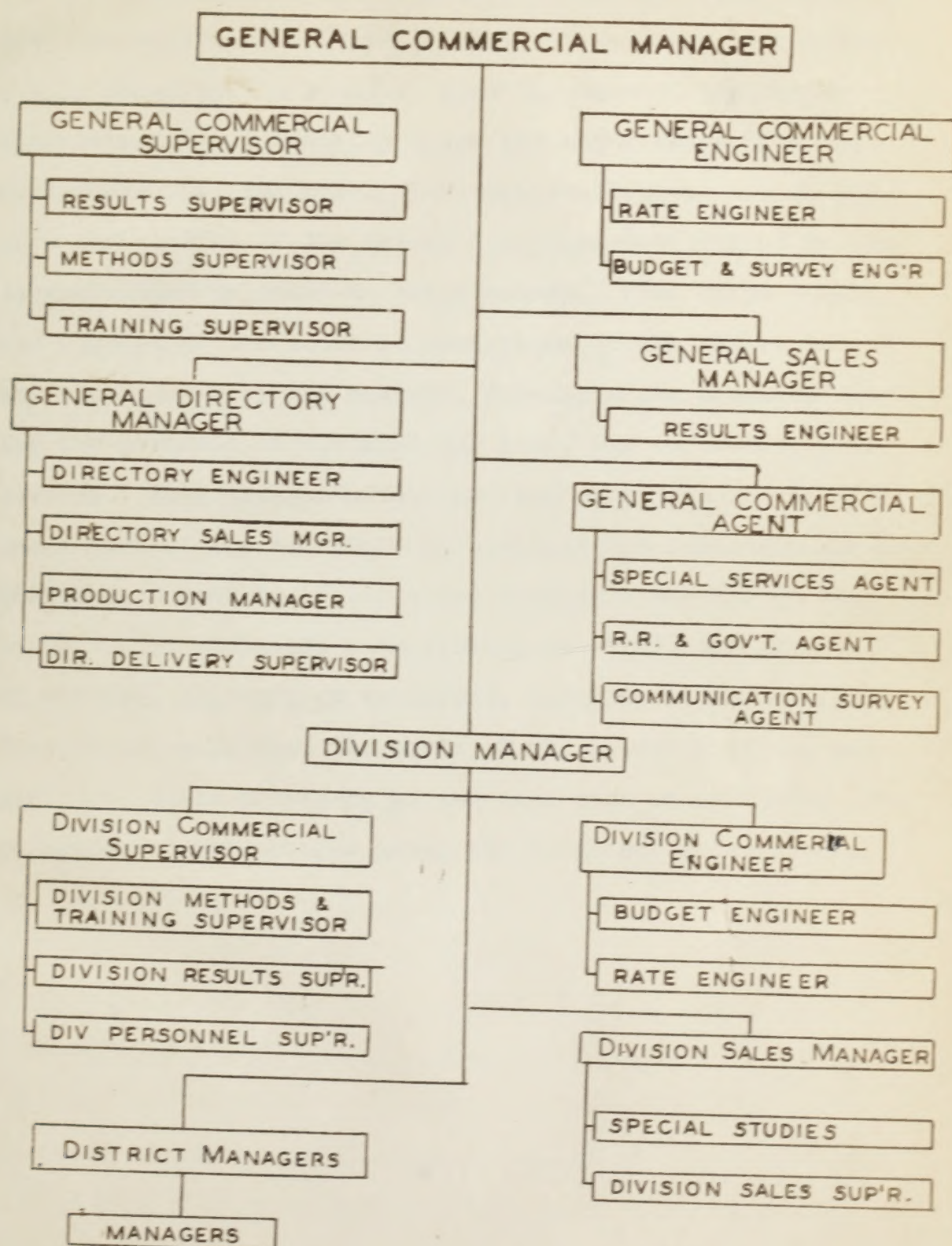


FIGURE 2

# ORGANIZATION CHART

## COMMERCIAL DEPARTMENT

### GENERAL COMMERCE MANAGER

<div data-bbox="165 345 639 416"> <div>CLERK</div> <div>RECEIPT</div> </div> <div data-bbox="165 437 639 508"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="165 529 639 600"> <div>RECEIPT</div> <div>RECEIPT</div> </div>	<div data-bbox="864 345 1338 416"> <div>CLERK</div> <div>RECEIPT</div> </div> <div data-bbox="864 437 1338 508"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="864 529 1338 600"> <div>RECEIPT</div> <div>RECEIPT</div> </div>
<div data-bbox="165 621 639 692"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="165 713 639 784"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="165 805 639 876"> <div>RECEIPT</div> <div>RECEIPT</div> </div>	<div data-bbox="864 621 1338 692"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="864 713 1338 784"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="864 805 1338 876"> <div>RECEIPT</div> <div>RECEIPT</div> </div>
<div data-bbox="165 897 639 968"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="165 989 639 1060"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="165 1081 639 1152"> <div>RECEIPT</div> <div>RECEIPT</div> </div>	<div data-bbox="864 897 1338 968"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="864 989 1338 1060"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="864 1081 1338 1152"> <div>RECEIPT</div> <div>RECEIPT</div> </div>

<div data-bbox="165 1244 639 1316"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="165 1336 639 1408"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="165 1428 639 1500"> <div>RECEIPT</div> <div>RECEIPT</div> </div>	<div data-bbox="864 1244 1338 1316"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="864 1336 1338 1408"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="864 1428 1338 1500"> <div>RECEIPT</div> <div>RECEIPT</div> </div>
<div data-bbox="165 1520 639 1592"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="165 1612 639 1684"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="165 1704 639 1776"> <div>RECEIPT</div> <div>RECEIPT</div> </div>	<div data-bbox="864 1520 1338 1592"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="864 1612 1338 1684"> <div>RECEIPT</div> <div>RECEIPT</div> </div> <div data-bbox="864 1704 1338 1776"> <div>RECEIPT</div> <div>RECEIPT</div> </div>



this work has a direct bearing on the types and quality of service which are received by subscribers to telephone service, the existence of this general office group is not generally known by the public. This function of the Commercial Department is usually under the supervision of a General Commercial Engineer. The work consists in making surveys and studies of the actual telephone development in the larger cities by house-to-house counts. From these counts and studies of the economic conditions in the cities and in the area served by the company, forecasts are prepared showing the probable development for five, ten and twenty year periods. From these studies and from other studies of the usage made of the telephone by business and residence subscribers, schedules of rates and charges are prepared and periodically reviewed, establishing the different classes of service, measured or unlimited, individual line or party line, which will meet the needs of the majority of the subscribers, while providing at the same time an equitable distribution of the charges among the different subscribers.

reaction toward the company".(28)

The subscribers to telephone service, as a general rule, expect that there will be temporary interruptions of service, and are for the most part tolerant of occasional mistakes in operating and accounting. Yet, when they go to a business office of the Telephone Company, they are not as likely to allow the same degree of error. They look upon

(28) Reference B, page 1

(29) Reference B, page 1





## 2. PERSONNEL AND TRAINING

The Commercial Department handles most of the business contacts with the public. It is essential, therefore, that the service which the public receives, when it visits or calls a Commercial office of the Bell System, be most effective and complete. The business offices are not merely places where bills are paid or where orders affecting service are received, they are the central points to which all the subscribers come when they seek information regarding business policies and conditions which they feel are unsatisfactory and should be corrected.

To the vast majority of its subscribers "the telephone business office represents the Telephone Company,"(28) It is important, therefore, that each contact with the public, and there are "about 100,000,000 contacts a year," be "handled in a personalized way, to create a favorable impression upon the customer and a favorable attitude on his part, or the liability which each contact may become, if ineffectively handled, is a source of irritation and a bad reaction toward the company".(29)

The subscribers to telephone service, as a general rule, expect that there will be temporary interruptions of service, and are for the most part tolerant of occasional mistakes in operating and accounting, but, when they go to a business office of the Telephone Company, they are not as likely to allow the same degree of error. They look upon

(28) Reference 8, page 1

(29) Reference 9, page 1





the personnel of the business offices as representatives of the management and as the management itself and are apt to regard any failure as a company failure. (30) The management in the Bell System has long realized that the quality of service which its subscribers receive at the business offices should be of the highest grade and is continually striving to improve this branch of the service. (31) This method was recognized as unsatisfactory, but, as there were in most cities only a small number of employees in each business office, it did not seem desirable or economical to establish centralized offices for employing men and women for commercial work. In the other departments, the number of employees was larger, but even there conferences between department heads brought out the fact that although their employment arrangements were more complete, "they were not entirely satisfactory." (32) As the "average" in the Commercial Department in 1924 and 1929 averaged over 80% (33) for the Bell System as a whole, the matter of proper selection of employees became an important problem.

In an effort to improve the method of selecting employees, some of the companies established centralized offices for interviewing applicants for all the departments. The interviewers in these offices soon acquired a thorough knowledge of the requirements in each department and, through their contacts with a large number of applicants they were able to

(30) Reference 10, page 61

(32) Reference 12, page 5





## a. PERSONNEL

One of the subjects which is receiving the greatest attention in the attempt to improve the business office service is the proper selection of the personnel.

Up to a few years ago the selection of employees for the business offices was made "more or less at random from people who applied at the counter or to various members of the department".(31) This method was recognized as unsatisfactory, but, as there were in most cities only a small number of employees in each business office, it did not seem desirable or economical to establish centralized offices for employing men and women for commercial work. In the other departments, the number of employees was larger, but even there conferences between department heads brought out the fact that although their employment arrangements were more complete, "they were not entirely satisfactory."(31) As the "force losses in the Commercial Department in 1928 and 1929 averaged over 30%" (32) for the Bell System as a whole, the matter of proper selection of employees became an important problem.

In an effort to improve the method of selecting employees, some of the companies established centralized offices for interviewing applicants for all the departments. The interviewers in these offices soon acquired a thorough knowledge of the requirements in each department and, through their contacts with a large number of applicants they were able to

(31) Reference 11, page 39

(32) Reference 12, page 5





select those who had the proper qualifications for the different kinds of work.

The employment department, however, does not do the actual hiring. When an employee is needed in a business office, the employment supervisor selects a few applicants who seem to have the necessary qualifications. These prospects are interviewed by the manager and one or two supervisors in an effort to retain the one best qualified.

Besides relieving the local managers of the necessity of interviewing a large number of applicants, the centralized employment office has proven valuable also to the other departments. For example, an applicant might apply for work in the commercial department when there are no vacancies in a business office, while there might be vacancies in the plant or traffic departments. Where the applicants give promise of being qualified to do business office work, an effort is made to interest them in the work of the other departments. This tends to increase the value of the services of the applicants when it is later found possible to transfer them to the commercial department.

It is generally agreed now in the Bell System that "an important factor in enabling the business office to properly represent the company is the employment in the business office of a reasonable proportion of employees with a telephone background seasoned by experience in other departments." (33)

(33) Reference 14, pages 14-15





In all the companies where the centralized plan of employment has been put in effect, it has been found that the type of employees was much better, that the number of transfers of qualified people from one department to another was much greater and that "recruiting capable employees from all departments" was "one of the most effective ways of establishing the business office on a basis which is representative of the company viewpoint".(34) In one company "more than 40 per cent. of the employees in the business offices have had some experience in one or more of the other departments."(35)

The establishment of a centralized employment bureau has had the added advantage of reducing the percentage of force losses. The following illustrates a typical case of the change in the trend of force losses in one company where a centralized employment office was established. The centralized employment office in this company was opened in June, 1929. In the first two quarters of 1929, the force losses on an annual basis were 12.6% and 16.9%. The percentage of losses reached a peak in the third quarter of 18.9%. During the next two quarters the percentage of losses dropped to 10.4%. These percentages take into consideration the lay-offs which were due to business recession.(36) Figure 3 on page 28 shows the trend in Force Losses for the Bell System since 1928.

(34) Reference 13, page 3

(35) Reference 15, page 38

(36) Reference 11, page 42





## BUSINESS OFFICE SERVICE

## BUSINESS OFFICE PERSONNEL

PER CENT. OF FORCE LOSSES  
BY QUARTERS

BELL OPERATING COMPANIES

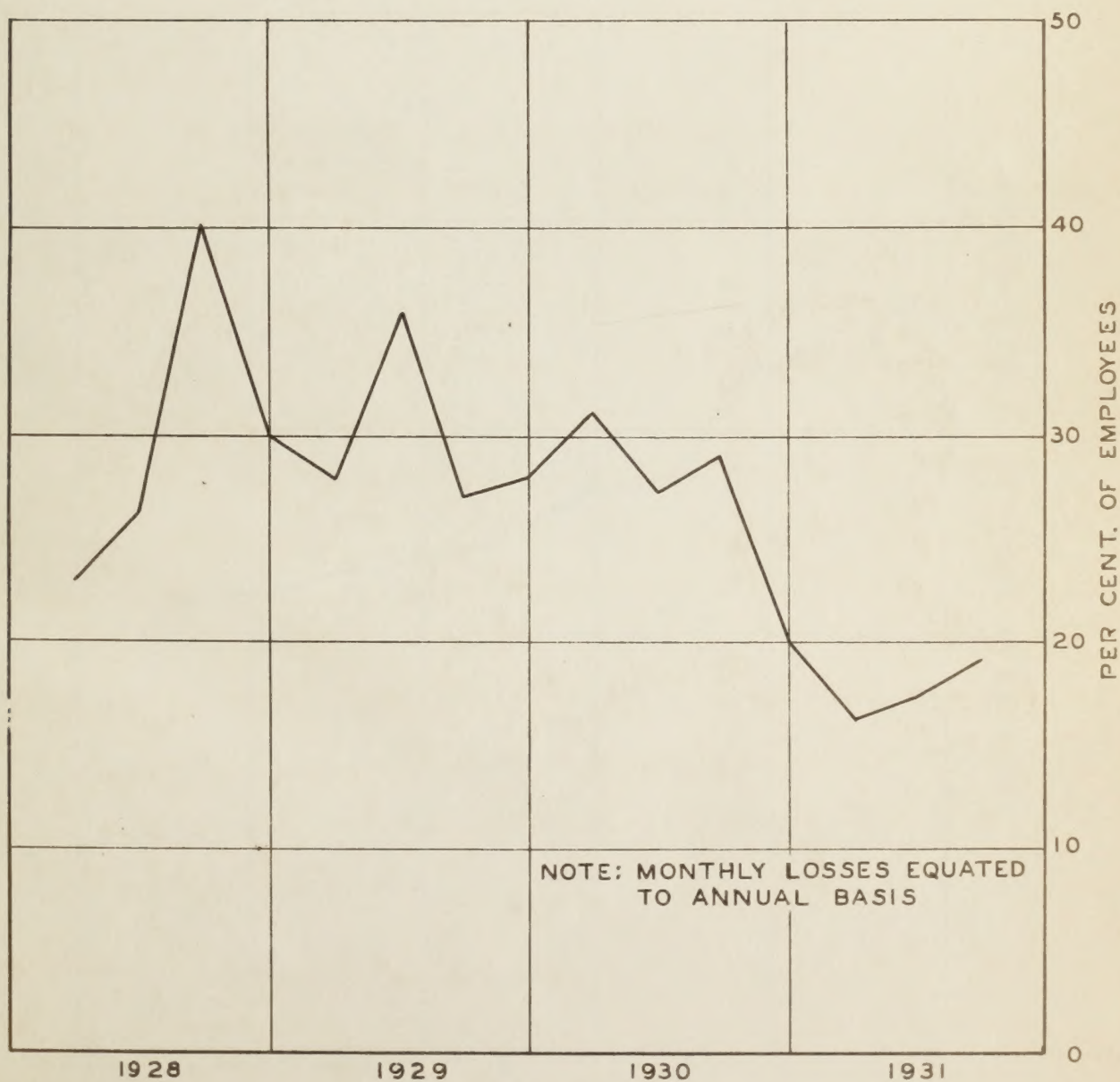


FIGURE 3





## BUSINESS OFFICE SERVICE

## BUSINESS OFFICE PERSONNEL

EMPLOYEES WITH EXPERIENCE

IN OTHER DEPARTMENTS

BELL OPERATING COMPANIES

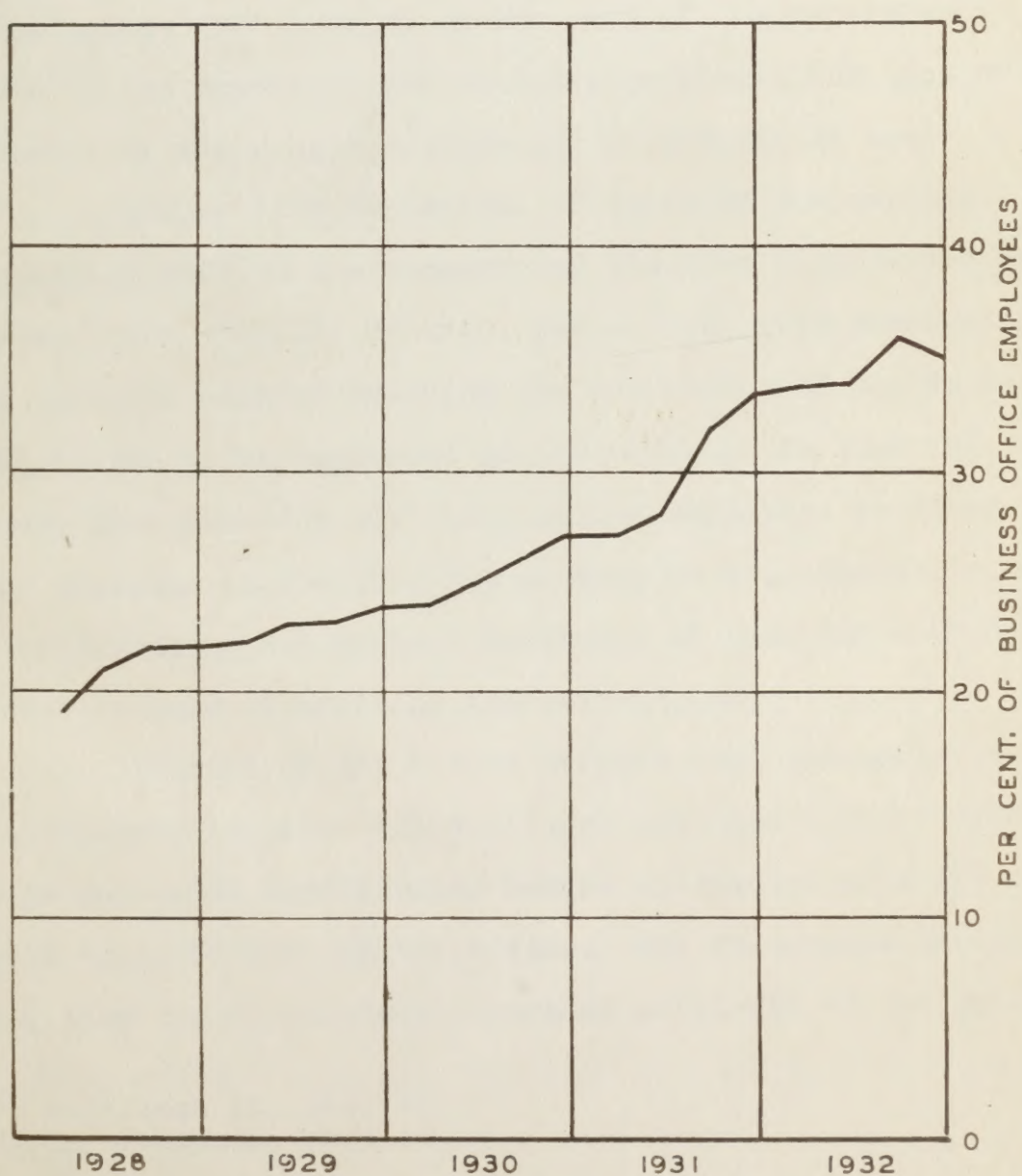


FIGURE 4





## b. TRAINING

The determination of a definite policy in the matter of selecting the proper personnel, however, presupposes that the personnel will be given some degree of training for the work. For a number of years, the degree of training which the business office employees were receiving was not adequate for the work which they were expected to do. The principal defect in the system of training "was a lack of information"(37) on the quality of the service which the employees were giving, an inadequate appreciation on the part of the supervisory forces of the extent of the training problems, and lack of knowledge of the proper methods and procedures to use.

Before 1929 the matter of training new employees was usually left to the manager and the more experienced employees. The manager, however, was so busy with management work that the work of training the new employees was delegated to the older employees in the office. In some instances this plan was very good as the employees received their training on the job, but in many cases, "those giving the instructions had no real knowledge of teaching methods or were in need of training themselves".(38)

In some of the larger offices, the new employees were assigned to minor clerical work and were rotated from job to job until they finally became acquainted with the different types of work in the office. But throughout the process, they rarely obtained a working knowledge of the poli-

(37) Reference 15, page 42

(38) Reference 16, page 44





cies back of each procedure or the relation of one part of the work to the other work in the department or to the work of the other departments. This method of training might have continued in use, if there had been no changes in the organization of the business offices.

As the number of subscribers in each exchange increased, it became evident that the work in the business offices had to be divided among the different employees in such a manner that a maximum degree of service, compatible with efficiency, would result. The functional plan had been in use for some time, but was not adequate for the larger offices. Under the functional plan the work functions were divided among different groups, one group handling accounts and collections and another group handling orders. This arrangement was gradually replaced by the service representative plan, under which plan each employee handled all the business office transactions for a group of subscribers. It, therefore, became impracticable to rotate the employers through different assignments and it was important that each employee receive a thorough training in all the phases of business office work.

The training requirements, however, varied in different cities and at different times and the matter of the type of training to be given had to be determined in detail in each company and for different size cities. Another factor which had to be given consideration was the telephone background which the different employees had. It was soon discovered that the method of training "on-the-job" was impractical as the new employees would be trained at the ex-







pense of customer reactions.

The present method of class training was finally decided upon as the only proper method of preparing the new employees for work in the business offices. The training period usually covers a period of ten weeks during which time the new employees cover the types of business office transactions which occur most frequently. The "Case method" is used throughout the training period. The instructor first explains a typical case, then he gives a demonstration of the case discussed and the new employees are given "a sufficient number of practice cases to insure a complete understanding of them".(39)

The training of the employees does not stop with the class room instructions, but is continued after they are working in a business office. Their work is supervised and the training is continued; they may even be returned for class room instruction for retraining in parts of the course.

The training of the new employees is also supplemented by visits to the other departments so that they may understand the part each department plays in meeting the subscribers' wants. These visits are planned in such a way that they will tie in with the particular lesson or subject being discussed in the class room.

In the training period the policies of the Bell System and its objectives are carefully explained, as well as the customer's viewpoint and possible reactions to the System practices. The new employees are taught from the  
(39) Reference 16, page 44





beginning to look at matters from the customer's point of view and to analyze the customer's reasons for calling or visiting the business office. The point is also stressed that it is the desire of the company to meet every legitimate request and want of its subscribers.

After the new employees have been assigned to a business office, the work is periodically reviewed by the instructors. The business office records of each employee are inspected at different times for any irregularities either in practice or procedure. Their current work is also analyzed by means of records which they keep of each telephone or personal contact with a subscriber. Most of the data, however, on which the instructors determine which employees need further training, are obtained from direct observations on the telephone lines which are used by the business office employees. In a further section of this thesis under "Service Results" the matter of Service Observing is treated more in detail.

Last decade taken a more active interest in the proper location of its business offices and in the organization and conduct of the personnel, and very definite progress has been made during recent years in placing business office service on a more desirable basis.

(40) Reference 8, page 1.

(41) Reference 10, page 1.





### 3. BUSINESS OFFICE OPERATION

As we have seen in a previous section the business office of a Telephone Company is to most people the Company itself. It is the location to which they go on any telephone matters or which they call or to which they write. It is necessary, therefore, "if the business office is to represent the Telephone Company", that the quality of service which the customer receives at a business reflect the proper attitude of the Company. "It quite naturally follows", also, that "the business offices must be so located that the customer's business may be transacted conveniently from his standpoint." (40)

Business offices have been operated since the early days of the business and have been freely used in good times and bad". (41) "But while the necessity of providing business office service has been practically as old as the business itself" (41), the management in the Bell System has during the last decade taken a more active interest in the proper location of its business offices and in the organization and conduct of the personnel, and very definite progress has been made during recent years in placing business office service on a more desirable basis. In general, the

question of business office representation has been divided into two parts, the first as it applies to the smaller exchanges and the second as it applies to the larger metropolitan centers served by several exchanges.

(40) Reference 8, page 1

(41) Reference 15, page 1





## a. REPRESENTATION

As the business office is to a majority of the public the only point of contact between the Bell System employees and individual customers, it must be situated in a convenient location and accessible without undue time and effort. At the end of 1928, about 20 per cent. of the telephone exchanges in the Bell System had no business offices. This condition existed even in some exchanges having almost 10,000 subscribers. A complete study was made in 1928 of the business office situation and although it was felt that it would not be economical to establish business offices in every exchange area, still it was decided to establish such arrangements that a customer might be connected in a simple and direct way with an employee who could transact whatever business the customer might have.

The problem of providing adequate representation in each exchange involves the consideration of many factors such as the size of the exchange, the transportation systems, neighborhood business centers, etc. It is evident, therefore, that each city and each exchange must be studied separately if the maximum benefit is to be derived from the locations of the business offices. In general, the question of business office representation has been divided into two parts, the first as it applies to the smaller exchanges and the second as it applies to the larger Metropolitan centers served by several exchanges.

In the smaller exchanges, that is, those ex-





changes having less than 25,000 stations, it was felt that one business office would be adequate for the service needs of the customers. In these exchanges, there are three different types of representation in use. In the larger exchanges of this group, the office is in charge of a commercial manager who devotes all of his time to commercial work. He represents the Telephone Company in all business transactions with the public in his area and has the direct responsibility of providing for the wants of the customers and of maintaining good public relations.

In the medium sized exchanges in this group, the business office is in charge of a commercial manager in a neighboring exchange, or of a non-functional manager. Where the business office comes directly under the supervision of a commercial manager of an adjacent exchange, the manager must divide his time between two or more offices. The management of the business office is usually entrusted to an older female employee who has been trained to handle most of the daily business office contacts. In case of problems or questions which demand the attention of the manager, she makes the necessary arrangements whereby the manager will meet the customer.

Where the business office is in charge of a non-functional manager, he "is a joint employee with the plant department." (42) He is assisted by a female employee who devotes all of her time or most of her time to commercial





work. The non-functional manager has all the responsibilities of the commercial manager of a larger exchange, and on commercial matters reports to a district commercial manager. In plant matters, however, he reports to a district plant superintendent. This divided responsibility naturally does not lead to the same efficiency in commercial work as in the larger exchanges and at times the district commercial manager must use tact and diplomacy "to get the commercial work done in these small exchanges." (42) The arrangement, however, is preferable to the condition which would exist if the Telephone Company were without a representative functioning as manager. It is also more economical for the amount of commercial work involved is not sufficient to keep one man busy all the time.

In the smallest exchanges the resident manager is usually a traffic employee, either the chief operator or one working under her supervision. Here again the responsibility is divided and depending on whether the work is of a commercial or traffic nature, she reports to the commercial manager of a nearby exchange or to a district traffic superintendent. This division of responsibility, however, does not seem to cause any trouble as the chief operator in these small exchanges knows every subscriber and is able to anticipate their wants and needs.

Definite progress is being made in the establishment of business offices in each exchange, as may be seen from





Figure 5, on page 39. The point has not yet been attained where every exchange has its own business office, but it is evident from this chart that consideration has been given to providing the public with a larger number of locations where it may conveniently transact telephone business.

The matter of providing adequate business office facilities in the large metropolitan centers has also been fully studied during the last few years. Prior to 1927 most of the business office work was concentrated in a few large offices in each metropolitan center, each business office serving several exchanges. In many instances the commercial manager of an exchange was many miles away from the exchange area and all transactions had to be carried on by telephone or correspondence. Payment agencies were established in many residential districts or neighborhood business centers, but the service which the customers received at these agencies was impersonal and where they had to contact with a manager personally it was often necessary for them to travel many miles.

Early in 1928, in several of the larger cities, the experiment was tried of establishing smaller business offices at some central point in some of the exchanges. All the subscribers' accounts were transferred to the new offices and all the subscribers in the area to be served by the office were notified of the change.

The opening of these offices had an immediate effect on the subscribers as it made it "easy for them to

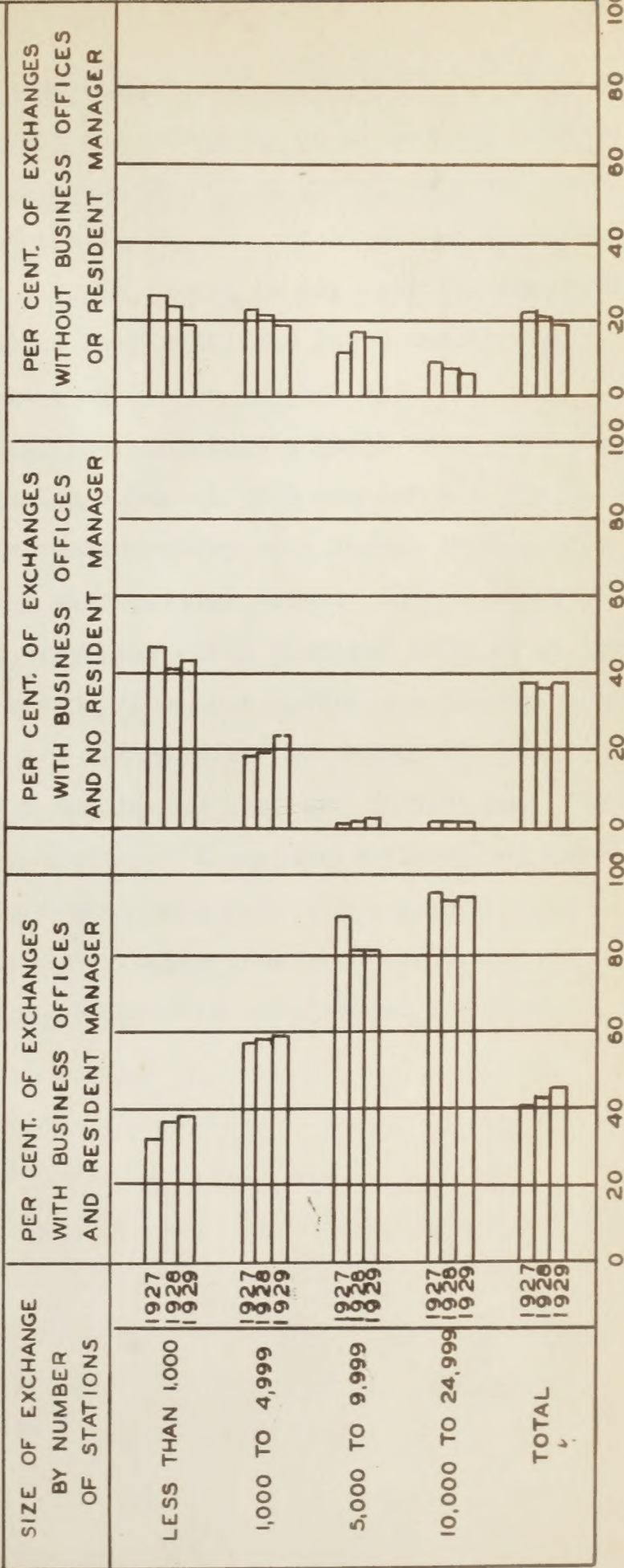




# BUSINESS OFFICE REPRESENTATION IN EXCHANGES OF LESS THAN 25,000 STATIONS

## BELL OPERATING COMPANIES

NOTE-IN SOME EXCHANGES WHERE A BUSINESS OFFICE IS PROVIDED THE MANAGER IS LOCATED AT SOME OTHER EXCHANGE AND THE BUSINESS OFFICE IS IN CHARGE OF A CLERK, CHIEF OPERATOR OR OTHER EMPLOYEE IN THE FOLLOWING TABLE, AN EMPLOYEE-IRRESPECTIVE OF DEPARTMENT-WHO CARRIES THE TITLE OF MANAGER AND IS LOCATED IN THE EXCHANGE CONCERNED, IS REFERRED TO AS RESIDENT MANAGER







conduct their business on a face to face basis"(43). It also had a desirable effect on the employees as it enabled them to get acquainted with the subscribers and give them a more personalized service. On the whole, the establishment of these decentralized offices did not result in any material increase in costs, for the rent in many cases was lower and it was possible to discontinue some of the payment agencies.

The success of the experiments which were started in many of the Associated Companies in 1928 has led all the Companies to give greater consideration to a larger number of business offices in the Metropolitan areas. In the twenty largest cities, there were only sixty business offices at the end of 1927. At the end of 1929 this number had increased to 117. Since that year the increase in the number of business offices has been slight due to the economic conditions. The experience of the Bell System with smaller business offices has been such that plans have been made for complete decentralization as rapidly as suitable locations are found and as the leases expire at the present centralized locations.

before the change of the average length of time of these subscriber contracts. Similar time studies were made after the change and it was found that the average time spent with each employee was less under the counter-lease plan. In the end of 1929, seventeen business offices had been established under this arrangement. They had been well approved and in 1930, the experiment was extended and eighty-five

(43) Reference 19, page 7





## b. ARRANGEMENT

Concurrent with its activities in placing the business offices in more convenient and more easily accessible locations the management in the Bell System also considered plans for improving the appearance and arrangement of its offices.

Prior to 1927 all the business offices were of the counter type; the subscriber and the employees transacting all the business while standing on either side of a counter. The management felt that this arrangement had too much of the earmarks of a work shop or store. This method of meeting the subscribers had been in operation for a number of years and very little thought had been given to the problem of making the subscribers' visits to a business office more pleasant. During 1927 a few of the Associated Companies tried out the plan of removing the counters and having the employees meet the subscribers while seated at desks. It was feared at first that this change would result in the subscriber taking a longer time to tell his story. Time studies had been made before the change of the average length of time of these subscriber contacts. Similar time studies were made after the change and it was found that the average time spent with each employee was less under the counter-less plan. At the end of 1927, seventeen business offices had been established under this arrangement. They had met with such approval that in 1928, the experiment was extended and eighty-five additional offices were converted to the counter-less type.





The number of counter-less offices has continued to increase as is shown on Figure 6 on page 43. In most cases it has been found that the counter type of office can be changed to the counter-less type at very little expense and without the need of much larger quarters. It has been "the general opinion that this type of office offers improved service and greater customer convenience." (44)

Under the counter type of business office, it was also usual for the manager to be provided with a private office. With the changes to counter-less types of business office, it was decided to do away with these private offices and make the managers "visible and easily accessible". (45) This has aided in giving the business offices a more friendly atmosphere and has served to personalize the relations between the subscriber and the manager.

Other improvements have also been effected in connection with the establishment of the counter-less type of business offices. In many of the offices equipment displays have been arranged to give the subscribers illustrations of equipments which are available for use with residence or business service. These equipment displays are more or less complete and elaborate depending on the service requirements of the majority of the subscribers who visit the business offices.

In the larger centers, directory libraries and customers' rooms have also been added to improve the service

(44) Reference 15, page 17

(45) Reference 8, page 3





BUSINESS OFFICE SERVICE  
ESTABLISHMENT OF  
COUNTERLESS BUSINESS OFFICES

BELL OPERATING COMPANIES

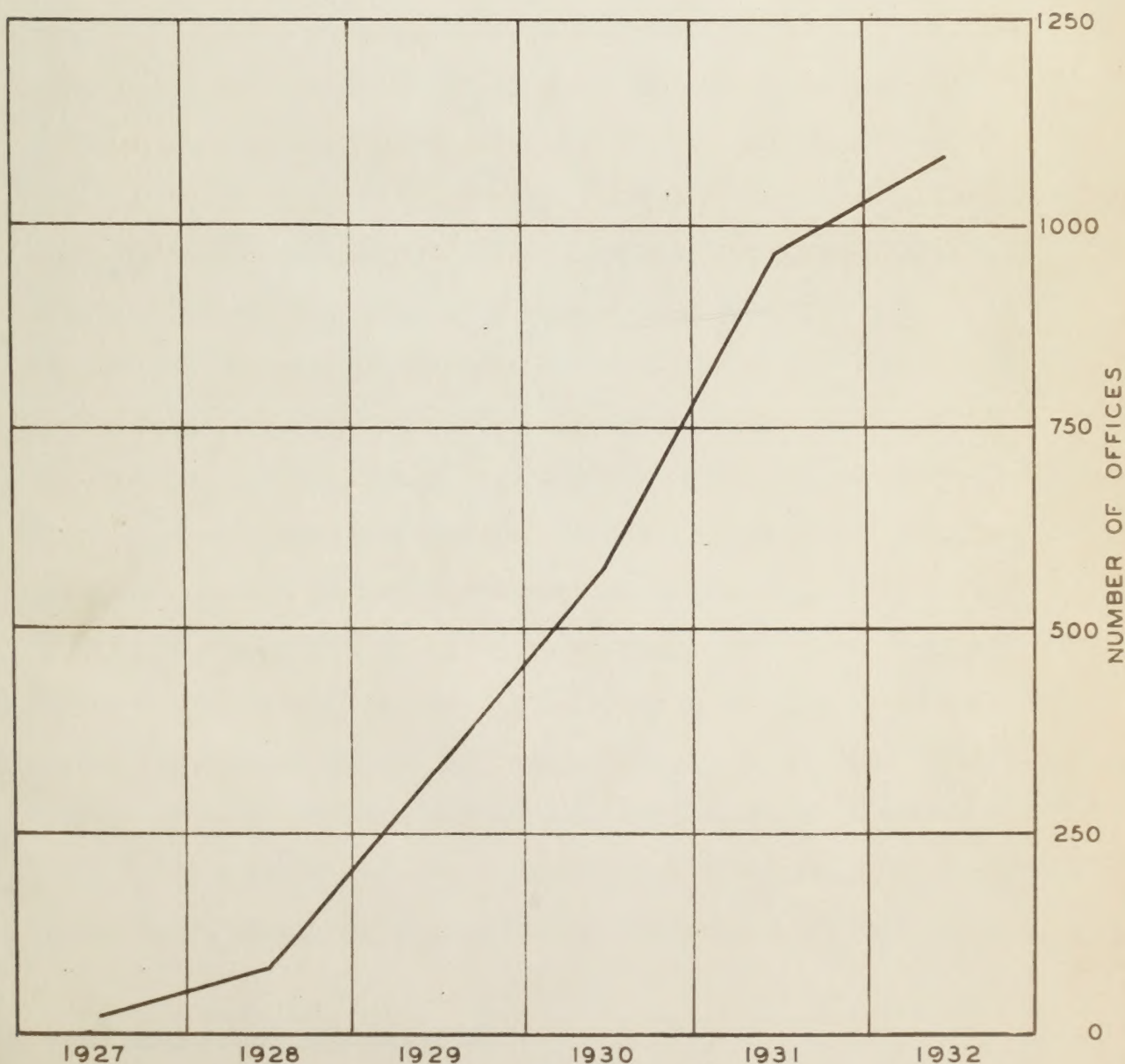


FIGURE 6





of toll users and particularly of these who have occasion to make a large number of toll calls from a given city, while they are away from their homes or offices.

In most instances, where improvements in the appearance and arrangement of a business office have been deemed desirable, the management has been cautious in the matter of equipment and decorations and have worked on the principle that "good pleasing effects can be obtained without either actual or apparent lavish expenditures." (46)

The public would be expected to look for a different attitude and appearance not only from the employees in their contacts but also from those they do not meet face-to-face. (47)

The management tried to bring about this desired attitude by instituting some complete training courses for the employees and the supervisory forces. It did not, however, have any index of the efficacy of this training. The criticisms and complaints received by the managers and officials were not numerous enough to provide data from which the services of the business offices might be properly rated. It was felt, therefore, that some means should be adopted whereby more complete data could be obtained on the performance of business office employees. It was decided that the best method of obtaining "the information concerning the quality of service rendered by the business offices" was to make observations on "a sufficient number of contacts to

(47) Reference 20, page 1  
(46) Reference 15, page 13





## c. SERVICE OBSERVING

The obligations of the Bell System "to the public expressed by Mr. Gifford in his statement of policy,"(47) however, do not end with the provision of business offices more centrally located and with better appointments. If the management had been content with these two improvements for the public, it would have gone only half way in meeting the subscribers' wants for good commercial service. With the change of the "business office from a workshop to a reception room," the public would be expected to look for "a different attitude and appearance not only from the employees it meets but also from those the public does not meet face-to-face".(48)

The management tried to bring about this improved attitude by instituting more complete training courses for the employees and the supervisory forces. It did not, however, have any index of the efficacy of this training. The criticisms and complaints received by the managers and officials were not numerous enough to provide data from which the services of the business offices might be properly rated. It was felt, therefore, that some means should be adopted whereby more complete data would be obtained on the performance of business office employees. It was decided that the best method of obtaining "the information concerning the quality of service rendered by the business offices" was to make observations on "a sufficient number of contacts to

(47) Reference 20, page 1

(48) Reference 8, page 10





determine the extent of service defects".(49)

"The observing plan was aimed at a judgment or appraisal of the service as nearly as practicable from the point of view of the customer. It was intended that the service observing develop information as to the prevalence of defects detracting from a service which should be prompt, accurate and pleasing".(49)

During the first few years that service observations were taken of the different kinds of contacts made by business office employees, it was felt that the data were not conclusive of the quality of the business office service furnished. This was due to the fact that in many cases, the observers were not sufficiently experienced and trained. During 1927 and 1928, more attention was devoted to the training and supervision of service observers. Since then, "the data, although indicating a less favorable quality of service, because of their more representative nature, have furnished a better guide as to the training and other management activities required to place the service on a satisfactory basis".(50)

As the service observers became more experienced in the procedure of gathering, recording and summarizing service observing data, this work was extended to include a greater number of offices. Figure 7, on page 47, shows the extent to which service observations have been made since 1928.

"In order to secure a representative appraisal of the service", it was important that an adequate number of observa-

(49) Reference 28, page 1  
(50) Reference 13, page 14





# BUSINESS OFFICE SERVICE

## SERVICE OBSERVATION RESULTS

### EXTENT OF BUSINESS OFFICE SERVICE OBSERVING

#### BELL OPERATING COMPANIES

PER CENT. OF ACCOUNTS IN CITIES OBSERVED  
TO TOTAL COMPANY ACCOUNTS

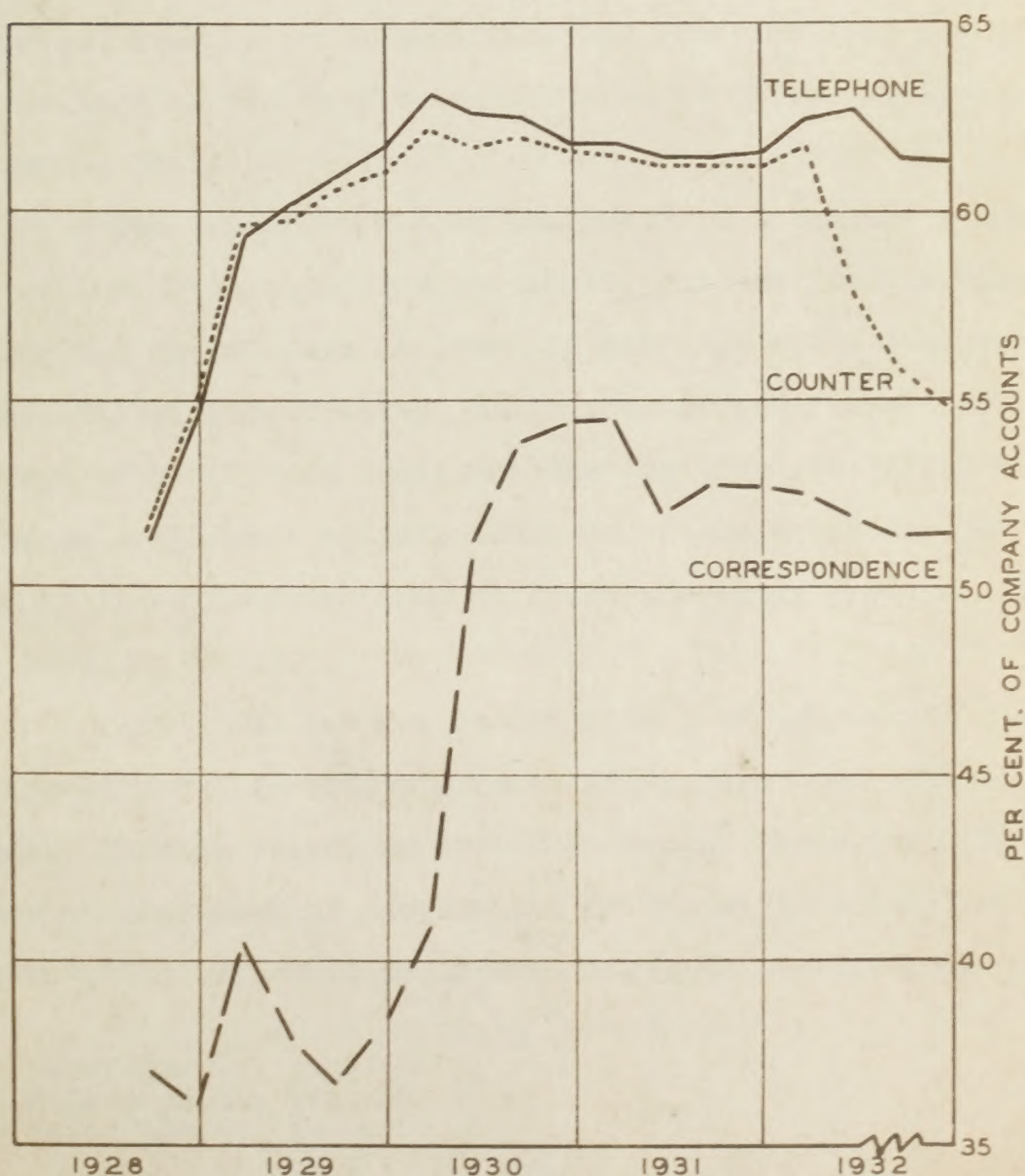


FIGURE 7





tions be taken and that they be suitably distributed among the telephone, counter, and mail contacts; the various classes of these contacts, the various periods of the day and month, and among different employees".(51)

The data which are obtained from these service observations are summarized daily and weekly and are used as "a background for daily discussions with all employees -- of the importance of rendering an efficient business office service" and of being "on the alert to see that their own performance does not deteriorate".(52) These observations are also summarized monthly for each office and district, and a graphic presentation of the results is distributed to the various organization heads.

The employees who do the observing work are not a part of the business office personnel, but are staff employees and are chosen from individuals who have "good judgment, dependability, impartiality, alertness and accuracy".(52) They are provided with equipment whereby they may listen to telephone or counter conversations and then record the details of these conversations on forms specially provided for this work.

"In order to provide definite data concerning the quality of service certain service items have been established. Service observing reflects through these items the extent of frequency of occurrences of the various service defects".(53) It would be impracticable to provide informa-

- (51) Reference 28, page 1
- (52) Reference 22, page 31
- (53) Reference 28, page 7





tion on every failure or fault which may arise in connection with these subscriber contacts. The service observers, therefore, cover in detail only the more significant defects in good business office service.

One of the important defects is Service Failures. Under this heading, the observers summarize the breakdowns in business office service from the subscriber's viewpoint but do not include mistakes in routine or procedure. There are several different types of breakdowns which are reported under Service Failures. The following, however, are the more important:

(a) Incorrect or Incomplete Information:

This type of service failure occurs when incorrect rates are quoted to a subscriber or when the subscriber is not given the complete information which he is entitled to received. The employee is also considered as having given incorrect information when he has quoted the rates properly, but the subscriber repeats the information incorrectly, and the employee fails to correct the subscriber's error.

As a general rule, applicants for telephone service are not familiar with the different rates or with the telephone company's methods of rendering the monthly bills. By explaining these matters to them at the initial contact, unnecessary and time consuming calls to the business office are avoided.

(b) Refusal of Reasonable Request:





Under this subheading are reported the cases where the employee refused to make an adjustment or grant a request which was clearly reasonable and was not contrary to the telephone company's routine methods or practices. Such cases include, for example, a request to have some work done in less than the regular period due to conditions which are obviously of an emergency nature. They include cases, also, where a subscriber requests details of the charges on his bill, but the employee quotes only the total amount and states that that is all the information that is readily available.

(c) Failure to take Effective Action:

This item includes such cases as where the employee fails to follow-up a subscriber's request in so far as it may be considered reasonable, or takes such action as to cause the subscriber to receive service which is different from the one he requested. This item also includes cases where the employee fails to keep a promise which was made to the subscriber or delays in keeping the promise beyond the time which might be considered reasonable.

Some examples of this type of failure are the failure of an employee to issue an order for service on the day on which it is received or a failure to report to the Repair Department a call from a subscriber that his service is out of order. Another example is the case where the information requested is not readily available and the employee fails to obtain the information and call the subscriber back.

Another important defect in business office serv-





ice which the telephone company is anxious to have its employees avoid is called an Irregularity. Under the general heading of Irregularity are included "occurrences which cause the customer to be affected by improper manner, attitude or treatment on the part of the business office employee handling the contact." In determining where an irregularity occurs, the subscriber's viewpoint is adopted "rather than a technical one, as the latter has the tendency to include inflections and refinements which may prove too exacting and detract attention from the more serious features of the service".(54) The principal types of defects which are included under the heading, Irregularity, are the following:

(a) Improper Announcement or Closing.

In answering a telephone call, business office employees are required to announce their name and on an outgoing call their name and the name of the company. This is considered by the telephone company to be dignified business procedure, and it is helpful to the subscriber in case it is later necessary for him to call again.

The business office employees are also expected to terminate a conversation with appropriate expressions so as to avoid leaving the subscriber in doubt when the contact has been concluded. An appropriate closing would include an assurance to the subscriber that the matter will receive attention.

(b) Objectionable Phraseology.

The pleasing service, which subscribers expect and





to which they are entitled, demands on the part of the employee the avoidance of technical words or phrases, mannerisms and slang expressions. Subscribers may also be annoyed and irritated by statements which appear to him as being dictatorial, arbitrary or allow of no appeal.

Under this heading are also included any reference to another department which might give the impression to the subscriber that the business office is trying to avoid the responsibility. The business office to most subscribers is the only point of contact which they have with the Telephone Company and as such it represents to them all the departments.

(c) Failure to Express Thanks or Regret.

As one of the objectives of good business office service is to convince the subscriber of the telephone company's willingness to be of service, experience indicates that this can be accomplished by encouraging the employees to express to the subscriber that the telephone company is grateful for his patronage. A failure on the part of the employee, therefore, to use expressions which definitely imply this willingness to serve, detracts from the pleasing service to which the subscriber is entitled and is considered a failure on the part of the employee in the proper performance of the work.

Equally as effective in rendering a pleasing service to subscribers and in removing any antagonisms, which they might have, is the adoption of a sincere and sympathetic attitude which is readily apparent whether the subscriber has





a real or fancied grievance. Expressions of regret are particularly appropriate when a subscriber requests that his service be terminated.

(d) Leaving and Returning to a Subscriber Immediately. The employee must leave the subscriber properly.

(35) At times in order to answer a subscriber's questions intelligently, it is necessary that the employee leave the telephone or counter in order to consult records in the files or in order to call another department. It is necessary in those cases that the employee apologize to the subscriber for leaving and that he determine that the subscriber is aware that the contact is being suspended by pausing to see if the subscriber comments. Otherwise the subscriber might keep on talking and on receiving no answer would believe that the employee had hung up.

When the subscriber has been asked to wait, the employee on resuming the conversation should properly apologize for the delay in the contact.

(e) Discourtesy.

Although the cases of discourtesy are rather infrequent, it is nevertheless watched for in the service observations, particularly in the tone of voice of the employee and his attitude.

The third type of service defect which is summarized under a general heading is Slow Answers. Under this heading are summarized those cases where "the customers wait





for attention longer than it is felt that they should be required to wait." (55) In the case of a telephone call, the employee is considered to have been slow in answering if "the interval between the time the employee's telephone is first rung until the employee answers the customer exceeds ten seconds."

(55)

In the case of a counter contact, the employee is considered to have been slow in answering if the subscriber has to wait two minutes before being waited on by the employee. All letters which are not acknowledged by the end of the next business day following their receipt are also counted in the summary.

The fourth type of service defect covers cases which are summarized under the heading Cases not Closed, and includes all cases where the business office employee is required to communicate further with the subscriber. An example of this type of defect occurs when an employee has failed or neglected to obtain all the necessary information for issuing a service order and had to recall the subscriber. Under this heading the observers also include cases where the employee did not have the information readily available to answer the subscriber's questions and had to arrange to obtain the information and call the subscriber later.

The fifth type of service defect involves cases which have been previously reported and on which satisfactory action was not taken or where the matter was not disposed of to the subscriber's satisfaction.

(55) Reference 28, page 15





## 1. Service Results

After the data are summarized, they are analyzed by the supervisory personnel to determine where improvements may be effected to reduce the unfavorable conditions and improve the service rendered by the business office.

In analyzing the results of service observations it was noted that "failure to take effective action" was one of the chief factors contributing to service failures, because the employees lost or misplaced the memoranda made at the time of the contact. This type of service failure was greatly reduced by supplying the employees with memorandum pads for recording all the data on the contact.

The number of cases of Incorrect or Incomplete Information was also found to be large in proportion to the other contacts. An analysis of this condition revealed that, because of the complexity of the schedules of rates, the employees could not remember all the rates for the many types of services. This defect was remedied by providing each employee with a chart on which are included the rates for those services about which inquiries are most commonly received.

The handling of service orders was also speeded up by changing the routing of the work so that all service applications on being received are sent directly to the service order clerks for transmission to the Plant Department.

Coincident with the change in the routing of service orders was the adoption of the plan of having all service orders, as far as possible, delivered to the Plant Department





on the day on which they were received. In some companies and in all the larger exchanges all the orders are delivered to the Plant Department the same day. In the smaller exchanges this is not always possible due to the small number of employees. In these exchanges, however, it is usually the practice to deliver all the orders which are received before 4:30 in the afternoon. On Figure 11, on page 57, is shown the progress which has been made in delivering service orders to the Plant Department on the day on which they are received.

In connection with the issuance of service orders, observations are also made of the number of orders which are delayed because of errors. Although the percentage is never very great, still the delay often causes unfavorable customer reactions. Figure 12, on page 57, shows the steady progress made during recent years in decreasing the percentage of service orders affected by errors.

The service observation data have been very useful in effecting "a number of changes in methods and equipment to bring about improvement in the service where the existence of the need" was apparent.(56)

In some instances the results for some years do not seem to show any great improvement over the similar periods of preceding years. This is particularly true of the results since 1929. In many respects the results for 1929 seem to show "less favorable quality of service results" than for 1928. This is "due largely to the improvements in supervis-

(56) Reference 22, page 32





## BUSINESS OFFICE SERVICE

## SERVICE ORDERS

BELL OPERATING COMPANIES

PER CENT. DELIVERED TO PLANT DAY APPLICATION TAKEN



FIGURE 11

PER CENT. AFFECTED BY ERROR

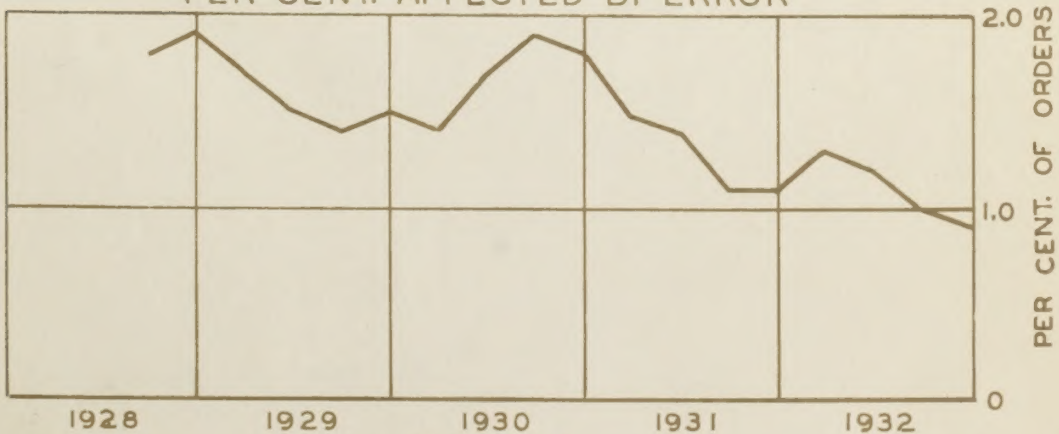
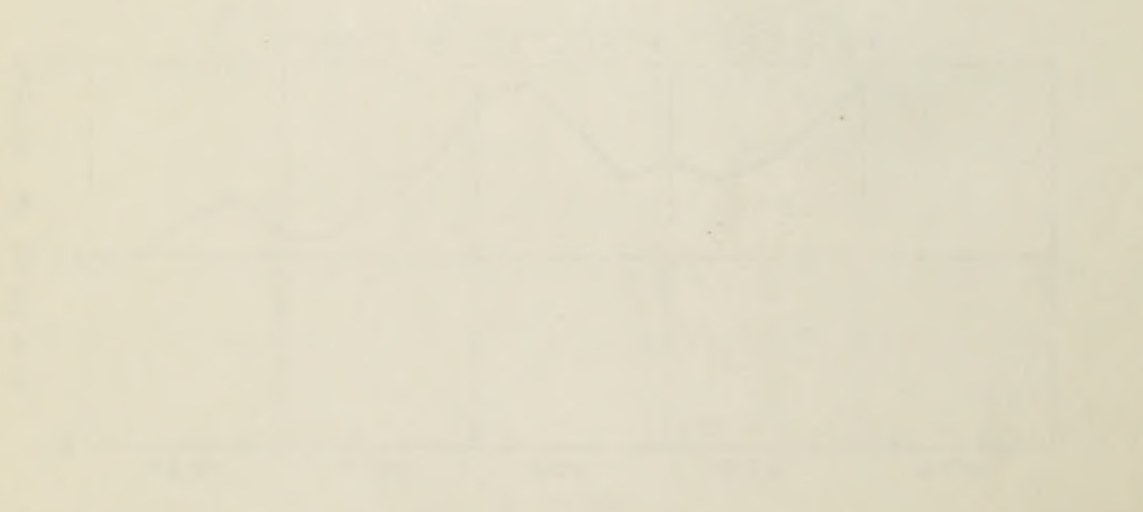
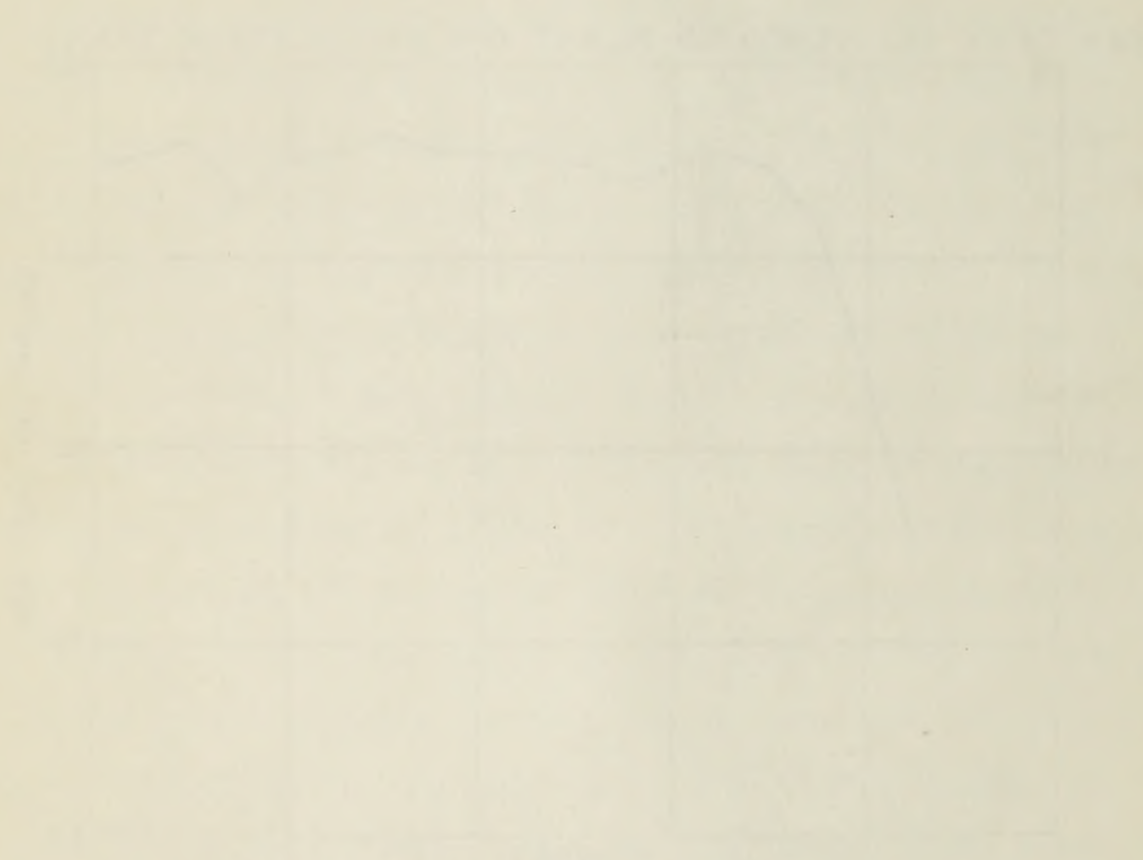


FIGURE 12

30000 50000 100000

20000 30000

10000 20000 30000





BUSINESS OFFICE SERVICE

ion and technique in observing in many cities where the results now furnish a more reliable picture of the service than formerly".(57)

Since 1929, the basis of measuring business office results has become more and more standardized and it may be seen from the charts that the quality of service is being slightly improved. The management in the Bell System, however, does not feel that it is entirely satisfactory; on the contrary, it is generally held that the quality of service as shown by the data "indicates definite opportunities for improvement" before "business office service can be regarded as satisfactory".(57)

On Figures 8, 9, and 10, are shown the quarterly results data since 1928 on the different types of service defects on telephone, counter and correspondence contacts.



FIGURE 8

CORRESPONDENCE



(57) Reference 12, page 19





# BUSINESS OFFICE SERVICE

## SERVICE OBSERVATION RESULTS

### BELL OPERATING COMPANIES

PER CENT. OF CONTACTS AFFECTED BY ERRORS

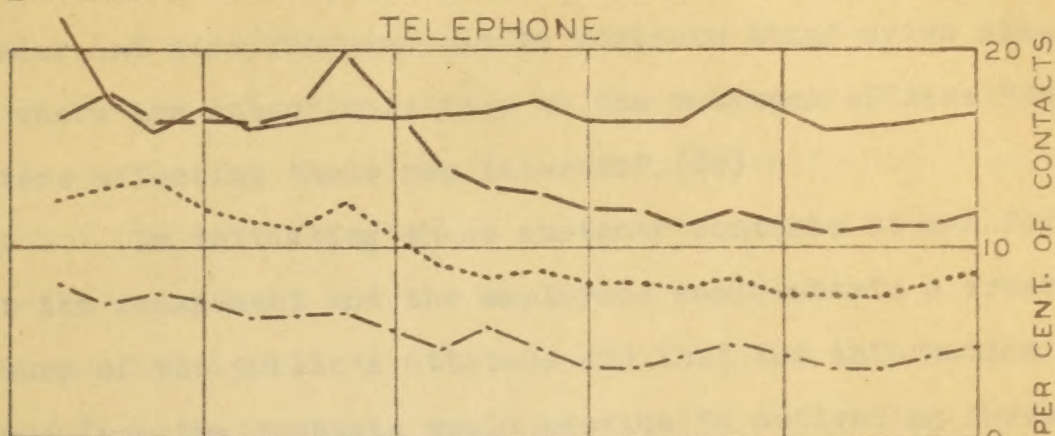


FIGURE 8

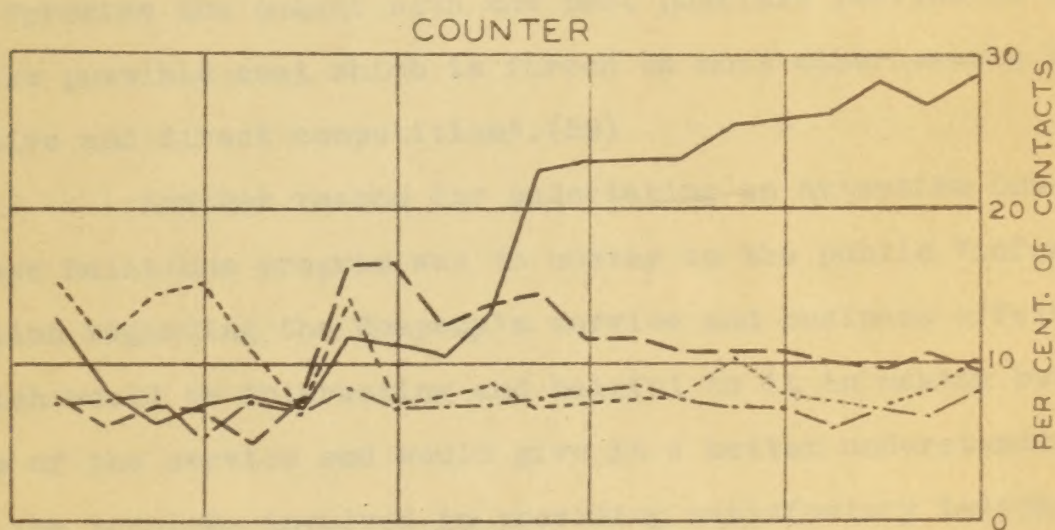


FIGURE 9

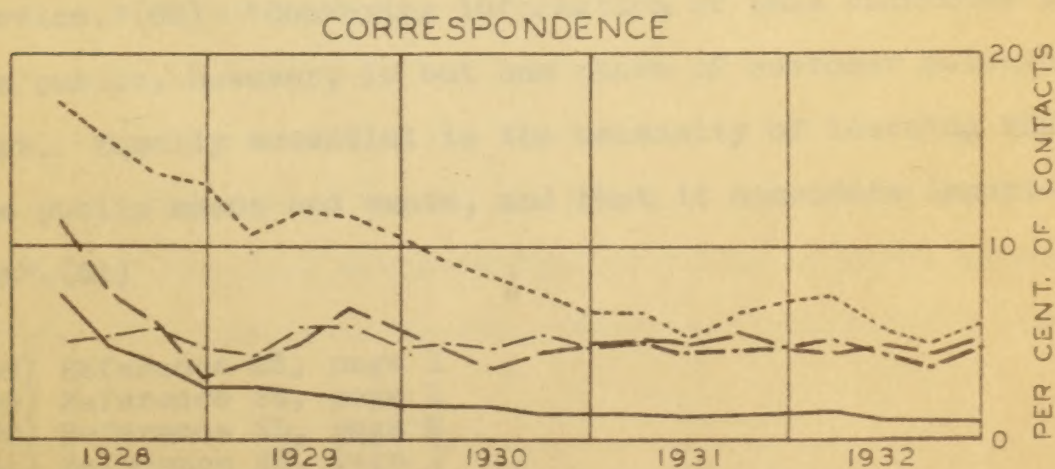


FIGURE 10

——— SLOW ATTENTION      ..... SERV. FAILURE  
 - - - - - IRREGULARITIES      ——— DELAYS





#### d. CUSTOMER RELATIONS ACTIVITIES

The responsibility which the Bell System has of giving a satisfactory service to its subscribers makes it necessary that it "take the initiative in reaching out for broader and more frequent public contacts than" arise simply where the subscribers come to the business offices "on matters affecting their own interest".(58)

In initiating these customer contacts it was felt that the management and the employees would obtain a truer picture of the public's attitude and that the information gained from the contacts would provide "a motivating force" to "provide the public with the best possible service at the least possible cost which is forced on most other people by active and direct competition".(59)

Another reason for undertaking an extensive Customer Relations program was to convey to the public "information regarding the Company's service and business affairs which would be interesting and helpful to it in making better use of the service and would give it a better understanding of the problems involved in providing satisfactory telephone service."(60) "Conveying information of this character to the public, however, is but one phase of customer relations work. Equally essential is the necessity of learning what the public needs and wants, and what it considers important".(61)

(58) Reference 23, page 1

(59) Reference 24, page 1

(60) Reference 25, page 2

(61) Reference 23, page 1





the public These customer relations activities are varied and take the form of planned interviews, visits to central offices, participation at public and school meetings and similar activities.

Telephone The planned interviews with subscribers are considered of outstanding importance as they offer a better qualitative picture of the service rendered. These interviews are "planned in advance as to the type of customer to be interviewed and subjects to be discussed".(62) In some companies they take the form of a questionnaire. The same questions are asked by all interviewers and the attitude of the subscribers is noted on cards prepared for that purpose. These cards are not produced during the interview but are used immediately afterward to record the subscriber's answers. The questions are changed periodically so that the reactions of the subscribers to various features of telephone service may be obtained accurately. These interviews are usually made by the managers and test interviews are made later by the district managers; the test interviews serve as a check on the accuracy of the information tabulated by the managers. Each manager, on returning to his office, makes a report of all service criticisms received during the interviews so that corrective treatment may be started immediately.

subscriber The data obtained are further summarized by districts and are used whenever consideration is given to any changes or corrections in the methods and practices to meet





the public's needs and wants. Some instances are found, however, where the subscriber's wishes would be detrimental to the service received by the other subscribers. In these cases an effort is "always made to convince the subscribers of the Telephone Company's point of view".(63)

Other companies use bill insert questionnaires. Only a few questions are asked as it is felt that better overall results are obtained than if a large number of questions was asked. In general only a small percentage of the subscribers answer these questionnaires, but it is felt that they serve "to promote good will even on the part of those customers who do not make replies".(64)

Several companies have also established Customer Service Bureaus consisting of men who specialize in handling the service requirements of larger business subscribers. Although the business subscribers comprise approximately only 20 per cent. of the total subscribers, they furnish from 50 to 60 per cent. of the exchange revenues. The telephone has become an absolute necessity to all types of business and it is therefore necessary that the business subscribers have an adequate telephone system. In providing an adequate telephone service to its business customers, the telephone company is also improving the value of the service for all residence subscribers, as an increasingly larger number of residence subscribers make use of the telephone in shopping or obtaining information from business concerns before starting on a

(63) Reference 26, page 3

(64) Reference 25, page 4





shopping trip.

The different types of business subscribers are divided among the various members of the Customer Service Bureaus who specialize in the requirements for telephone service which are peculiar to each type of business. Each member makes up a schedule of interviews to be made, having in mind the complexities of the subscriber's business and the frequency with which calls should be made.

The establishment of the Customer Service Bureaus has been a great aid to the business subscribers as they now contact with only one representative in the telephone company. This representative acts as a point of contact between the subscriber and the different departments of the telephone company and he has the responsibility of satisfying all the subscriber's reasonable wants. This centralization is also helpful to the business subscribers in that the employee of the Customer Service Bureau, by obtaining information on a given line of business, is in a better position to analyze the requirements for telephone service of other subscribers in the same or similar fields of industry.

The personnel of the Customer Service Bureaus is comprised of men who have had a broad telephone experience and are well informed of the telephone company's policies and methods as well as with the different types of services available.





## 1. Survey Activities

In the case of the larger subscribers, complete surveys or studies are made about every two years to determine more accurately the changing needs of these subscribers for telephone service. The completeness of these surveys depends, of course, on the size of the business concern and the territory over which it operates. In almost every Associated Company in the Bell System, a department has been set up which takes care of the needs for telephone service by power and other utility companies. The necessity of such a separate department becomes apparent when it is realized that "the consolidations of the bigger power interests have developed situations which complicate their communication requirements and makes even more important the factors of design, dependability and continuity of service".(65)

The surveys made for the Power Companies cover the three separate communication networks used by them. One is used for administrative and customer contacts, a second for load dispatching, line patrolling, maintenance and construction work, and the third for remote indication and control.

The more important of these three divisions of the communication networks of the power companies are those which apply to load dispatching and to remote control and indication. Some power companies had already built extensive communication networks to provide for these services as they felt that the telephone companies were not interested in this division of





their business. This misunderstanding was due primarily to the fact that the telephone companies did not at first realize the rigid requirements of the power companies. As the light and power companies, however, increased in size and as light and power became more and more necessities of modern life, the telephone companies began to study the problems of the power companies particularly as they affected an adequate and dependable communication service.

In most instances, where the power companies had constructed communication lines for power dispatching, the wires had been erected on the same right-of-way as the high tension lines and in some instances they were on the same pole structures. The result was that the communication lines were noisy due to the current induced in them from the power transmission lines. Communications over these lines was further impaired by the protection which had to be placed on the lines to make them safe. In making studies of the communication facilities used in load dispatching, these undesirable features were brought to the attention of the management of the power companies. They agreed that, although they were experts in the power field, communication problems could be handled better by the telephone company.

Even though the communication facilities erected by power companies were not entirely satisfactory, in many instances it would not have been economical for the power companies to completely abandon and replace them with service from the telephone companies. Each of the lines was





accordingly studied in detail to remove as far as possible the undesirable features of noise and induction and recommendations were made to the power companies of the methods by which their telephone network might be improved. Where the circuits could not be put in satisfactory condition, the power companies were advised to abandon the plant and replace it with circuits leased from the telephone companies. In order to extend the availability and utility of these privately owned communication facilities, standard agreements were also drawn up, whereby the power companies' telephone plant might under certain conditions be connected with the general network of the telephone companies. In this way the power companies were able to improve the quality of their communication network and retain in service that part of the network which still had a useful life.

The telephone companies also made critical studies of their own lines which were used by the power companies for dispatching purposes, as the communication network is the nerve system of a power company and it must always be available, especially in cases of emergency. It is, of course, impossible to determine when emergencies will occur so that instantaneous communication service is necessary over the twenty-four hours of the day. In this respect the communication requirements of the power companies are more rigid than those of other industries as the failure of the communication network in periods of emergency may result in serious loss of life and property.





In the more important locations of the power transmission network two or more communication services are recommended for dispatching purposes. In many instances these services are provided over different routes. One of the services is designated as the primary service and is usually of a higher grade than the other services. The other services are considered as secondary and are used in case of failure of the primary route or where the primary route is not available. Another factor which must be taken into consideration in the studies of the power companies' requirements is the development of a plan which "is so designed that it can readily be added to or rearranged to provide for future growth and for future interconnections of power through which costly power production and distribution are eliminated and new and flexible pools of power supply provided".(66)

In the matter of remote control and supervisory channels, the telephone companies had conferences with the manufacturers of the equipment so that the equipment could be used on the telephone circuits without unfavorable reactions. Where the preliminary tests showed that the use of such equipment with telephone circuits might cause undesirable conditions to exist in the regular telephone channels furnished to other subscribers, the manufacturers were asked to make minor changes in their equipment. These recommendations were not only beneficial to the manufacturers concerned, but also to the power companies as they could then make use of the equipment without having to construct expensive

(66) Reference 27, page 63





sive cable networks.

In making these studies of the power companies communication requirements, the Bell System was indirectly improving the service of its own subscribers. The individual telephone users are for the most part users of electric light and power also and the continued availability of electricity depends upon the dependability of the communication network which is used by the power companies.

Another division of the power companies' communication system which is also studied is the type of telephone service available for answering customers' inquiries. In their own contacts with subscribers, the telephone companies have endeavored to make it easy for the subscribers to make their wants known. The problem of the power companies is not very different from the problem of the telephone companies. In the case of both companies the customers should be able to reach an employee quickly by telephone and should be handled as courteously as if the call was made in person. The practices for handling customers' calls, however, are not uniform in power companies. In most cases customers' calls are answered in different departments, depending on the nature of the call. For example, if a customer calls regarding his bill the call is referred to the accounting department. The employees receiving these calls, as a rule, have other routine work to perform with the result that they are delayed in their own work. Again, they may be very efficient as bookkeepers but have not been trained to handle tel-





ephone contacts pleasingly so that the customer may not be entirely satisfied with the call. In other cases the call may be an inquiry regarding an appliance. These calls are usually referred to the sales people in the store. If they are busy with a customer and are trying to make a sale, they may let the customer wait on the line until he gets tired and hangs up.

In the larger cities and towns, power companies have adopted the plan of the telephone companies of having all the customer calls handled by a central service department and they have found the system more satisfactory. In some instances the centralization has resulted in better customer relations as the responsibility of satisfying the customer now evolves on only a few employees, who can be better trained to handle telephone contacts so as to eliminate any feeling of irritation on the part of the customer.

The survey work which the telephone companies have carried on with the power companies has also been carried on with other large concerns. With the ever increasing interest of the public in the buying and selling of securities, the brokerage houses found it difficult to satisfactorily handle all the calls received. As a rule most of these calls were referred to traders who in some offices had ten or more telephones in front of them on a desk. In other houses a large number of traders were assigned to this work, but as it was impossible to estimate the number of calls from day to day, this system was uneconomical. On many days there were enough





calls to keep only a few men busy, while on other days the load was too great for the force. After studying the peculiar requirements of this type of business, turrets were developed in which a large number of lines were terminated in keys and lamp signals so that the traders could readily and speedily take care of the large number of calls. The turrets were also designed to terminate lines from the turrets or switchboards of other brokerage houses or banks and large customers.

Similar studies were also made of the problems of department stores and other concerns where a large percentage of the ordering is done by telephone.

In more recent years the telephone facilities furnished in schools and colleges have been carefully studied. Here it was found that the problem was essentially different from the problem of furnishing telephone service for commercial purposes. The primary need for service in the case of colleges was purely social and usually involved three separate requirements. service for dormitories, for the sorority and fraternity houses and for the college administration.

Another type of service studies involves activities with architects. This work brings up "different problems from those which are encountered in the business field".(67) In these contacts with the architects the primary purpose is to "secure proper provision for entrance cables, riser cables, terminals, conduit, floor ducts, etc., to facilitate"(68)

(67) Reference 29, page 126

(68) Reference 29, page 125





the construction, installation and maintenance work on the telephone service used in the building after it is completed. These activities are also beneficial to the subscribers as it provides for the installation of telephones with a minimum delay and "eliminates the necessity of marring woodwork, walls and floors." (69)

"The three service features that come most readily to mind are the number of errors which are made in the directories, the length of time taken to produce the book and place it in the hands of the customers, and the success with which the new Directory is delivered to every customer at the time of issue." (71)

"These three features of directory service are the ones for which data are most readily obtainable but they are by no means all the features of directory service which are receiving attention. Practically all the companies have undertaken activities in connection with the improvement of introductory page content and treatment, the general appearance of the directories, the maintenance of directories in more suitable condition at both subscribers' and pay stations and the question of more adequate directory service to toll users." (72)

(70) Reference 15, page 25

(71) Reference 31, page 1

(69) Reference 30, page 129





#### 4. TELEPHONE DIRECTORIES

One of the important contacts between the telephone companies and their subscribers is the telephone directory. It is necessary, therefore, "if a satisfactory service, pleasing to the customers is to be rendered" that the telephone directories "be in keeping with other telephone" services.(70) "The three service features that come most readily to mind are the number of errors which are made in the directories, the length of time taken to produce the book and place it in the hands of the customers, and the success with which the new directory is delivered to every customer at the time of issue".(71)

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(70) Reference 13, page 29

(71) Reference 31, page 1

(72) Reference 31, page 3





## a. ACCURACY

One of the main service features of directory service is accuracy. The elimination of directory errors is "important because of the annoyance to customers" and because "errors involving omissions, incorrect telephone numbers and incorrect names are particularly serious in their effect on service".(73) "As an illustration of the effect of directory errors on service and on costs it has been estimated that as a result of reported errors of 3.42 per 1000 listings in directories, serving cities of over 50,000 population, subscribers made 48,000,000 calls annually to the information operators -- or intercepting operators involving a traffic expense of approximately \$1,000,000.00".(74)

The different telephone companies have made efforts to reduce the number of directory errors. The methods adopted have not been the same with every company but there was a uniform purpose. In one company the reports of directory errors were made up in greater detail for a period of twelve months "so that the source of errors was brought to light thus making it possible to remove the cause of many of the inaccuracies".(75) After the source had been definitely located, it was brought to the attention of the clerks responsible for the error in order that they might realize "the importance of exercising care in the handling of directory work".(75) These detailed reports also showed that most of

(73) Reference 12, page 30

(74) Reference 12, page 29

(75) Reference 31, page 8





the errors occurred during peak loads and resulted in a better programming of the forces so that a sufficient number of employees would be available in the directory department during the peak periods.

In another company where an endeavor was made to check each individual operation in the "procedure through which the listing material must pass from the time the subscriber contracts for service until the printing of the directory", it was felt that the separate checks permitted "the possibility of errors in subsequent steps" and for that reason did not "possess full effectiveness".(76)

A study of the errors made in the different steps showed that "a check of the printer's proof against the subscriber's application" would afford an opportunity of "detecting about 85 per cent. of the errors on new and changed listing insertions".(76) This overall check is in addition very simple in operation and inexpensive. It briefly consists of the following steps.

"The printer takes an impression of each day's directory listing slugs on a strip of gummed back paper which is forwarded to the directory department. The listings are then cut apart and posted on cards which are forwarded to the business offices concerned. Then these listings are checked with the application card and returned to the directory department".(76)

The use of the printer's proof, within a few days





of the issuance of the order involved, furnishes a check on the accuracy of the work of the commercial people in the business offices and its effect on the employees is "more impressive than the report of an error made from one to seven months after the fact".(77)

In the matter of production, the interval between the time when the directory is closed and the time when actual delivery is made to the customers depends on several factors which are not entirely within the control of the telephone companies. However, in most companies it was found that by the co-ordination of all the organizations involved it was possible to reduce the time necessary to produce and deliver the directories. In one company the plant department worked overtime in order to place the final orders in the hands of the directory organization in the shortest possible time. Fortunately the railroad was able to transport the directories from the printing plant to the point of distribution in a day less than previously had been required. A period of good weather during the actual delivery of the directory was possible reduction of one day of the time required for the physical delivery.(78)

The third service factor in directory service has to do with the success with which the new directories are placed in the hands of subscribers. In most companies where detailed studies were made of reports of non-delivery it was

(76) Reference 33, page 14  
(77) Reference 33, page 14

(78) Reference 33, page 14  
(79) Reference 33, page 14





## b. PRODUCTION AND DELIVERY

The efforts "to produce accurate directories"(78) would be fruitless, however, if the new directory did not get into the hands of the subscribers promptly. There are two factors involved in getting the directory into the hands of the subscribers, those of production and distribution.

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(78) Reference 34, page 15

(79) Reference 35, page 8





found "that inaccurate delivery records were responsible for about half of the delivery failures in the particular cases under investigation. "This condition when disclosed" was, of course, "not hard to remedy and several companies have established improved delivery records".(80) In addition to improving the delivery records, some companies have sought to enlist the co-operation and interest of all the subscribers by newspaper advertising, bill inserts, etc.

In one company, where the delivery records show that no delivery was made because the premises were vacant or because there was no one at home, it is the practice to call the subscribers on the telephone to verify the address so that the records may be corrected. In another company the number of delivery failures was reduced by furnishing the delivery men with distinctive uniforms. This served to quiet the suspicions of some of the residence subscribers who were reluctant to answer the door bell when the delivery men called. It is also the practice in some of the companies to make a check on the completeness of the delivery by calling a number of subscribers in each locality to verify the accuracy of the delivery report.

In compiling the data of delivery failures it is necessary in the large cities to ascertain carefully that there was an actual failure. It usually takes from one to two weeks in the very large cities to complete the delivery of the directories. As a rule the directories are delivered throughout

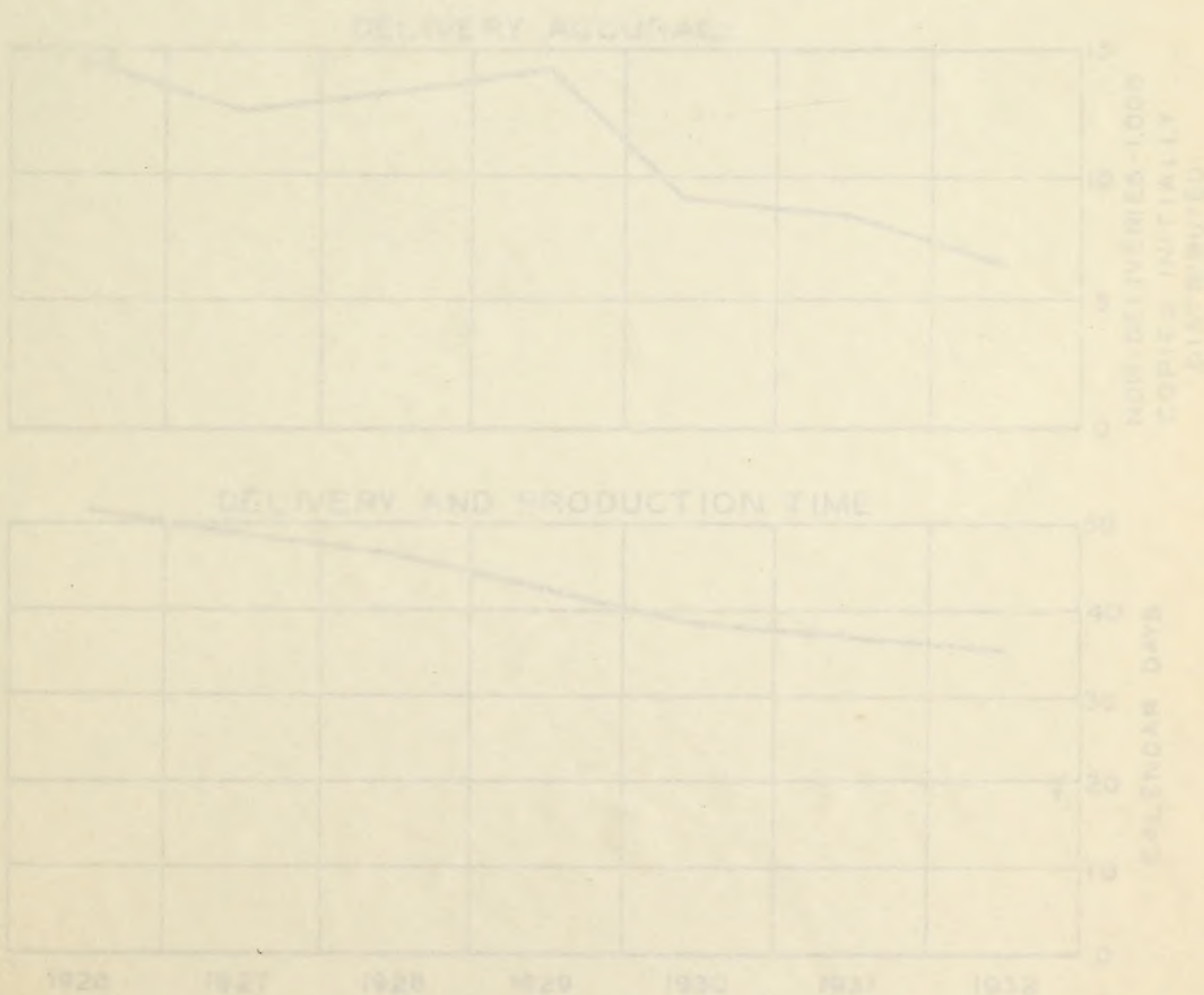




DIRECTORY SERVICE

the business section first and secondly in the residential sections. In many instances the business subscribers after having received the new directory at their place of business will report a failure in receiving a directory at their home on the same day. These cases, of course, can not properly be considered as failures and the matter is explained to the subscribers.

On Exhibit 12 A, on page 79, is shown graphically the improvement which has been made in recent years in the three main service features of the directory service.





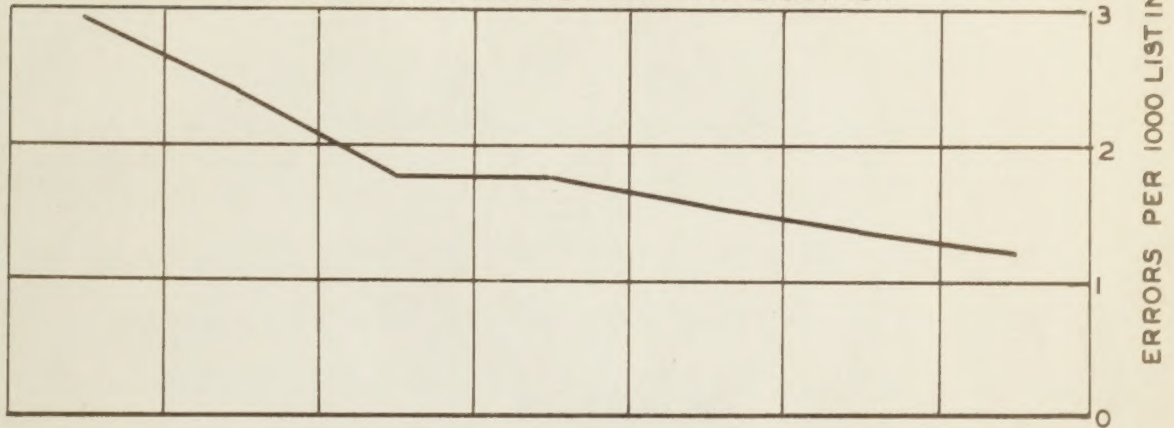


# DIRECTORY SERVICE

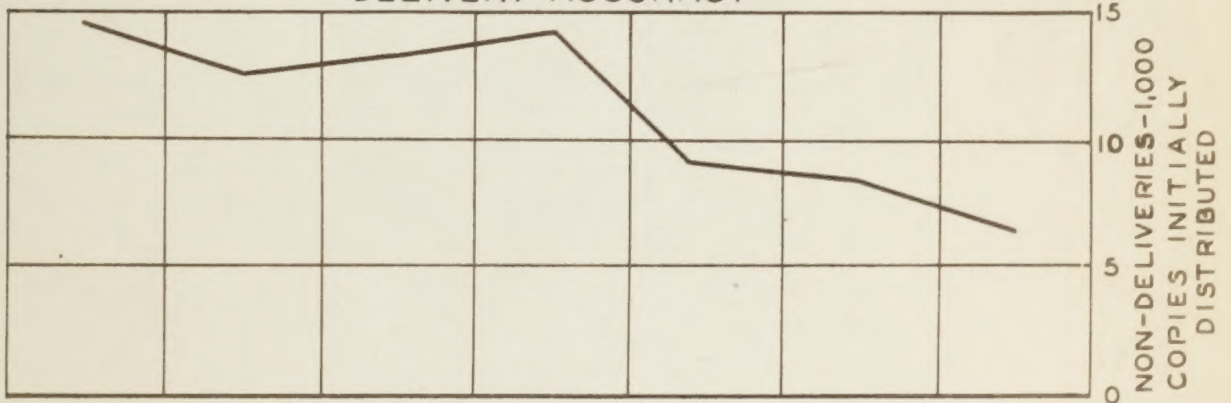
BELL OPERATING COMPANIES

CITIES OVER 50000 POPULATION

## ALPHABETICAL LISTING ACCURACY



## DELIVERY ACCURACY



## DELIVERY AND PRODUCTION TIME

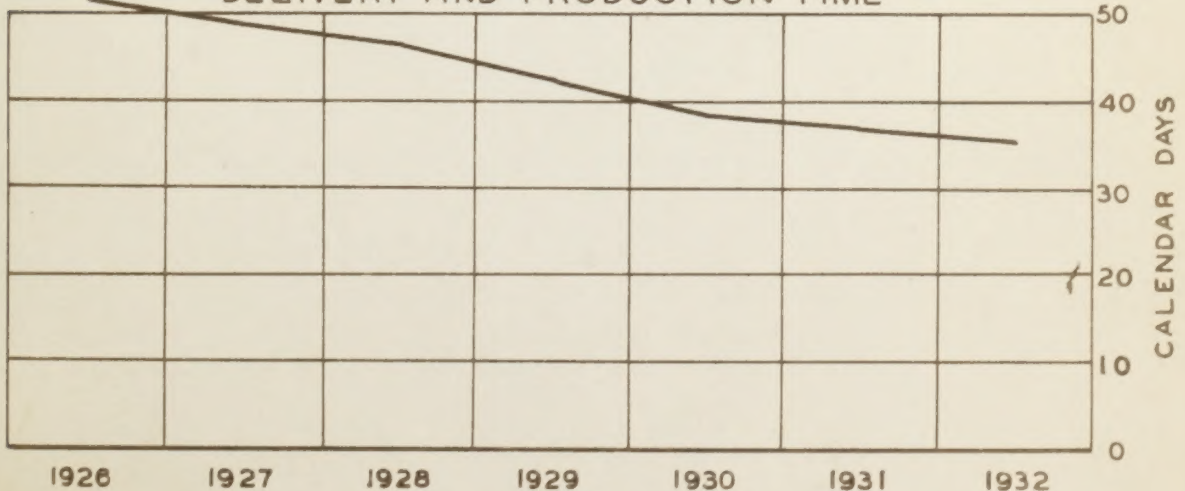


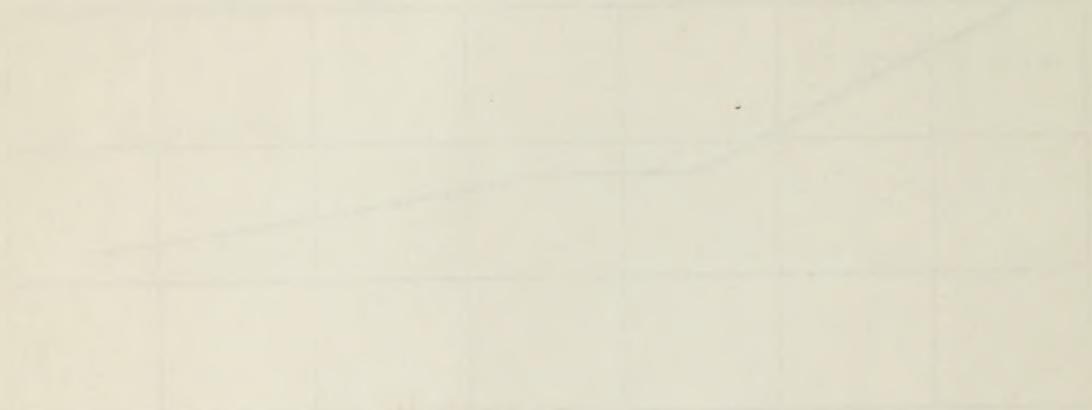
FIGURE 12A

ANNUAL REPORT

1914

THE COMPANY

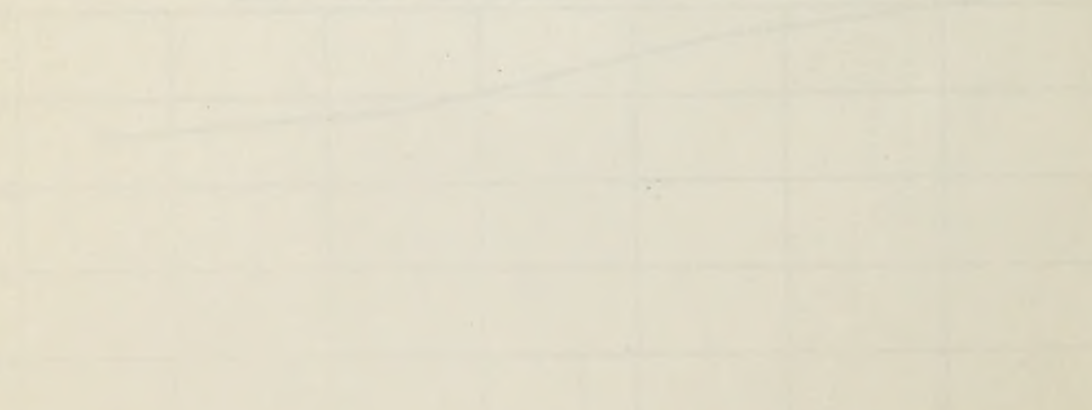
MANUFACTURING



SALES



EXPENSES AND DEPRECIATION





# TRAFFIC DEPARTMENT.

The traffic department in the Bell System has as its primary function the establishment of satisfactory telephone connections at the request of telephone subscribers.

The "activities incidental to this function" include selection and training of operating forces, field supervision of operating work, studies and measurements of operating results and of the proper distribution of circuits and operator loads, the development of improved operating methods, practices and equipment, the preparation of fundamental estimates of future traffic requirements, and recommendations for the construction of new facilities to care for them. These several parts of the traffic job can

## SECTION III

### TRAFFIC DEPARTMENT.

In this section, however, only those activities, which are of an operating nature, will be reviewed.

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In this section, however, only those activities, which are of an operating nature, will be reviewed.

of the operators is observed and directed by a group of Supervisors and Assistant Chief Operators who report to the Chief Operator of the Central Office. The Chief Operator's work is partly of an operating nature and partly administrative.

The District Traffic Supervisors are concerned primarily with the collection of data on the force requirements, the methods used and the results obtained.

These data formed the bases upon which the District, District

(81) Reference 5, page 101 Managers administer the work for





## 1. ORGANIZATION

The head of the Traffic Department in each Associated Company or Operating Area is usually known as the General Traffic Manager. Reporting to him are the Division Traffic Superintendents, the General Employment Supervisor and the General Traffic Supervisor. The Division Traffic Superintendents have reporting to them the District Traffic Superintendents, a Division Traffic Supervisor and a District Traffic Engineer. The supervisory people reporting to the District Traffic Superintendents are the Traffic Managers and a District Traffic Supervisor. The chief operators report to the Traffic Manager. An organization chart of the Traffic Department in an operating area is shown on Figure 13 on page 82.

The operating function of the Traffic Department is performed by the operators who comprise about one-half of all the employees in the Bell System. The work of the operators is observed and directed by a group of Supervisors and Assistant Chief Operators who report to the Chief Operator of the Central Office. The Chief Operator's work is partly of an operating nature and partly administrative.

The District Traffic Supervisors are concerned primarily with the collection of data on the force requirements, the methods used and the results obtained. These data formed the bases upon which the District, Division and General Traffic Managers administer the work for





## TRAFFIC DEPARTMENT

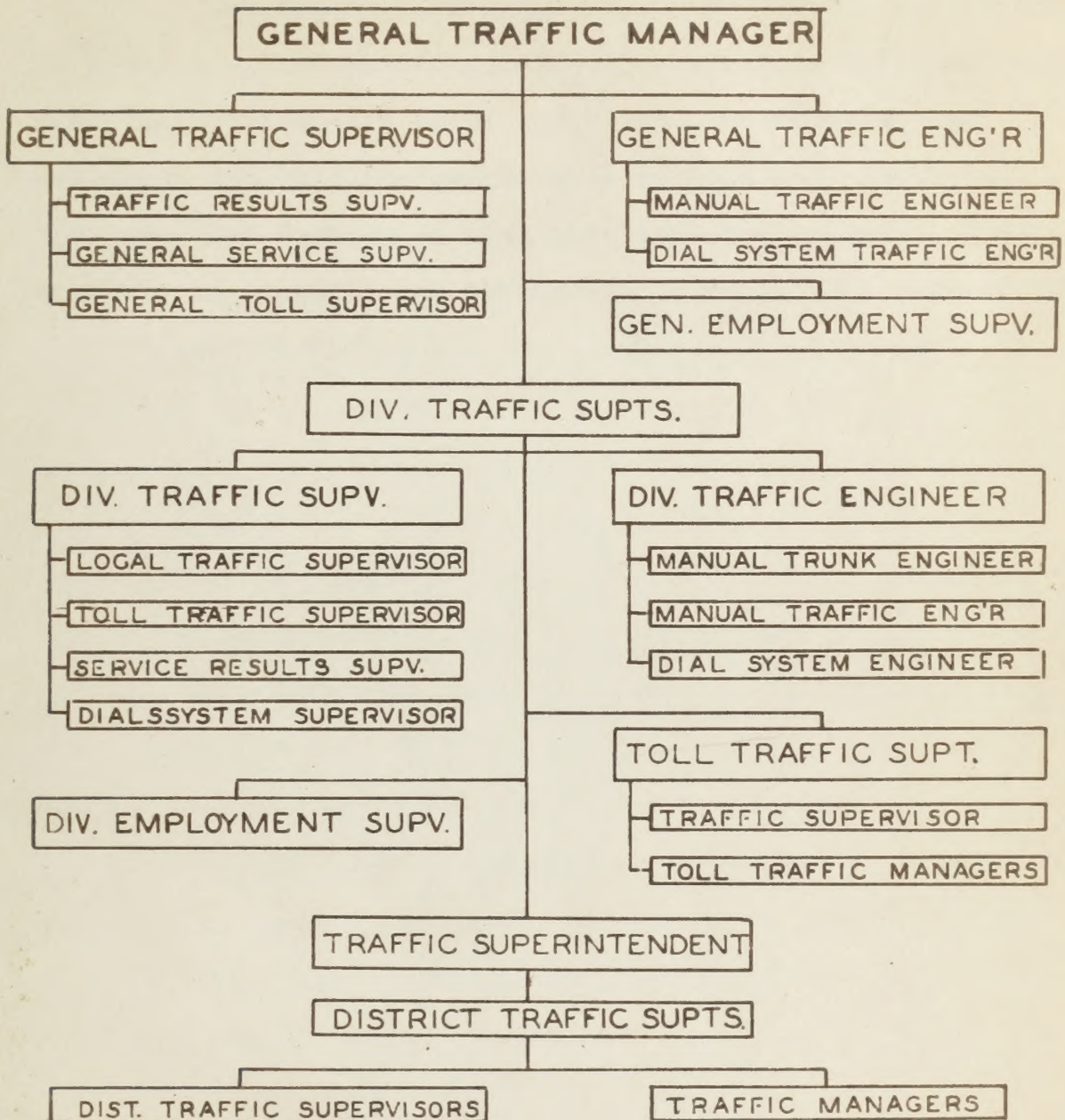


FIGURE 13





the best interests of the company and its subscribers.

The Engineering function of the Traffic Department is handled by the Division and General Traffic Engineers who make "analyses of equipment and space requirements, and equipment and building maintenance methods and results". They are also "concerned with the study and analyses of poor transmission reports and the design of remedial measures".(82)

age and under twenty-five. In most of the large cities, permanent employment offices are maintained in some central location. A large number of those employed apply through the recommendations of relatives or friends who are or have been in the employ of the Telephone Company. The successful applicants must measure up to rather strict qualifications as regards to health, reliability, intelligence and education.(83)

The recruiting of the needed number of operators for a number of years, however, has not been a difficult problem. It has, nevertheless, remained one of the most important. The Employment Supervisors have endeavored to employ only those who are potentially capable, energetic and congenial employees.(84)

The applicants, as a rule, are interviewed individually by the Employment Supervisor who tries to detect and intelligent selection of applicants. If the applicant would be a desirable addition to the operating forces.





## 2. PERSONNEL AND TRAINING

The personnel of the Traffic Department is composed almost entirely of young women, in fact the young women in the Traffic Department comprise about one-half of the total employees in the Bell System. "It is the usual practice to employ young women who have had no previous telephone experience" (83) and who are over eighteen years of age and under twenty-five. In most of the large cities, permanent employment offices are maintained in some central location. A large number of those employed apply through the recommendations of "relatives or friends who are or have been in the employ of the Telephone Company. The successful applicants must measure up to rather rigid qualifications in regard to health, reliability, intelligence and education".(83)

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The applicants, as a rule, are interviewed individually by the Employment Supervisor who tries by tactful and intelligent questions to ascertain if the applicant would be a desirable addition to the operating forces.

(83) Reference 5, page 111

(84) Reference 35a, page 36





The work of the Employment Supervisors is appraised from time to time by means of a follow-up of the status of those whom they employed and the data found are transmitted to them for their information.

The quality of the work of the Employment Supervisors can be judged in part by the steady decrease in force turnover. During recent years, of course, several factors have tended to reduce the percentage of the annual force losses, but, in a large measure, the steady decrease in this factor is due to a more careful and discriminating attitude on the part of the Employment Supervisors.

Another factor which has tended to reduce the percentage turnover of operators each year, has been the policy adopted in some companies since 1926 of building up a force of ex-employees for temporary work. This plan was initiated due to the occurrence during 1924 and 1925 of a condition where there was a surplus of operators to care for the normal loads. To avoid the repetition of similar situations, it was decided to try the plan of having a normal permanent force to take care of average conditions and to build up a force of ex-employees "to cover emergencies and unusual peaks of short duration".(85) In this plan the temporary work is divided as much as possible "among all temporary employees who are available, so as to keep them up-to-date on operating practice and technique".(85) The plan of using ex-employees for temporary work has resulted





in a slight decrease in operating costs, as these employees, as a rule, needed but little retraining "to keep them informed of changes in operating practice".(86) The morale of the permanent employees has also been improved as there is not present the fear that a decrease in traffic loads will lead to shortening of hours and decreased pay.

The "new employees are given the title of 'student' and spend about five weeks in an operators' school. Their time is divided between class room instruction, drills and special observation, and handling regular calls at switchboards under the supervision of instructors".(86a) When the student has completed the course in formal schooling, she is assigned to one of the central offices. After the new operator has been assigned to definite work, instruction continues under what is known as the observer-instructor plan. Under this plan, the work of each operator is observed periodically and her work is discussed with her away from the switchboard immediately after the observations have been made. In this manner each operator is encouraged to perform her work efficiently and expertly so that a satisfactory grade of service will be given at all times.

(86) Reference 36, page 35

(86a) Reference 5, page 111





### a. WORKING CONDITIONS

The Traffic Management has "for years recognized the importance of good working conditions. There was a time when very few companies paid much attention to these matters but now most up-to-date businesses aim to provide attractive working conditions".(87)

"Working conditions, using the term in its broadest sense, may be divided into three parts:

The Physical Environment,

The Employment Practices, and

The Work-itself.

The Physical Environment covers the central office buildings, the operating rooms and the operators' quarters, and includes such matters as ventilation, lighting, sanitation, safety, equipment, dining service, recreation facilities, etc."(88)

One of the major items in the physical environment under which the operators work is the proper selection of chairs, as the operators spend most of their working hours seated at the switchboard. In this matter the engineers of the Bell System, and particularly of the Department of Research, are continually on the alert for new types of chairs. In 1928, although it was felt that the chairs then in use were of "the best individual types", they were "redesigned to incorporate improvements suggested by recent developments in the study of posture".(87)

(87) Reference 35, page 38

(88) Reference 37, page 2





In the matter of dining room service and rest room quarters, it has been the aim to have them adequate in size and equipped in a comfortable and cheerful manner. Periodically the services furnished in these rooms are appraised by supervisory staffs and the operators are invited to offer suggestions which will tend to improve them and make them more satisfactory, as it is felt that these services are worth while only if they fit the real wants of those who use them.

There are now approximately five hundred central office dining rooms operated throughout the Bell System. In general the receipts from the dining rooms cover the expenses, except house service, capital charges and superintendence. Although it has been the purpose "to make the dining room service pay for itself", (89) "it is felt that the service and price objectives are of first importance", (90) and while in 1922 there was a deficit from this service of 25 per cent., in 1929 the deficit had been reduced to 1.5 per cent.

Close attention is also given to the matter of a healthful working environment and the avoidance of accidents. During the last fifteen years, the trend in sickness and accidents has been gradually downward. This has been due in part to the well rounded health programs and courses which are given each year to the employees. During recent years the Benefit and Health Departments "have developed a nutrition course and practically all the Associated Companies

(89) Reference 35, page 38

(90) Reference 38, page 31





have one or more instructors" (90) for educating the operating forces.

In connection with the health program, "an increasing number of companies are also cooperating with the employees in promoting cultural and technical courses. This has consisted chiefly of bringing to the employees' attention the opportunities available in the community and helping them to take advantage of these opportunities".(90)

The Employment Practices have to do with the treatment of such matters as hours of work, reliefs, tardiness and absence, overtime, evening and night work, Sunday and holiday work, transfers, etc.

For a number of years the subject of employment practices was not a very serious problem. During more recent years, however, due to the restriction in the growth of the operating forces, the decrease in turnover and the increase in the average length of service of the traffic employees have necessitated closer scrutiny of the employment practices, especially as they applied to working hours. As the central offices are open twenty-four hours a day, it is important that a sufficient number of people be on duty at all times to properly handle the work, and that the conditions of work during night hours and on Sundays and holidays be made attractive enough to induce the employees to accept these unattractive periods of work. This problem has been met by having a scale of differentials graded according to the time





at which the employees' working time ends, and by "shortening the tricks which end later than 10 P.M. to six hours overall with a half hour combined supper and relief period".(91)

The third factor in working conditions concerns "the work-itself, and has to do with the amount of work, the regularity and permanency of employment and the handling of the force in such matters as, placement training, supervision, promotion, resignation, dismissals and transfers".(92)

In the traffic department perhaps more than in any other department in the Bell System, it is possible to equate the relative amount of effort and time necessary to perform each of the different functions of the work. By careful observations and timing it has been possible to determine the number of toll calls which an operator can satisfactorily handle in an hour or the number of the different kinds of local calls. With these data and by means of carefully prepared estimates of the volume of calls which will be made at different hours of the day and on the different days of the week, schedules are set up so that a sufficient number of operators will be on duty to efficiently handle the traffic.

Reference has already been made to the plan which was initiated in 1926 of employing former operators to help out in temporary emergency and peak loads. The adoption of this plan has had the advantage of making it possible to level the load of the permanent operators and has proven

(91) Reference 36, page 7

(92) Reference 36, page 3





valuable during vacation periods, as the regular operators are not called upon to take over the work of those who are away.

In 1928 a new procedure was introduced whereby an operator could more easily obtain a transfer to another department or to another Associated Company. Previous to that year, the operator desiring a transfer often had to go through the process of seeking an interview with the employment supervisor of the department or company, to which she wished to be transferred, and had to go through the same formalities as a prospective employee. Under the new procedure there is "a more liberal attitude toward accepting transfers of employees who have good reason for moving" (93) and arrangements are made by the employee's supervisor, who forwards, to the other department or company, full data on the employee along with an opinion of the employee's qualifications. This arrangement has been particularly valuable to the older employees whose opportunities for advancement in the operating room may have become limited and whose operating experience would be of value in another department.





## b. SUPERVISORY PERSONNEL

The improvements which have been effected from time to time in the Employment Practices and the changes which have been made in the working conditions would have been only partly effective if methods had not been adopted of improving the type of the supervisory personnel under whom the operators are assigned. The new operator is considered about 56 per cent. efficient when she is first assigned to a switchboard and her training from then on is largely 'on the job' under the guidance of the supervisors. Much of the ability and interest of the operators depends, for that reason, on the leadership of the supervisory people, who are from time to time given intensive retraining courses and are taught "the relative importance of the various features of operating and supervisory work, how to analyze the work of individual operators, the manner of developing individuals and how to effectively direct their work. In many offices, a definite portion of the chief operators' time each day has been scheduled on development of supervisors in their sections".(94)

In these retraining courses the chief operators discuss frankly with the supervisors "the mistakes and faults which appear to be interfering with their progress" and "make constructive suggestions as to the ways and means

(94) Reference 35, page 18

(95) Reference 35, page 5





### 3. LOCAL MANUAL OPERATION

of rectifying the conditions". The good work which is done by the supervisors is also recognized "by encouragement and commendation".(95) This is called manual service. Under the other method, called dial service, the connections between the different telephone stations are established by means of mechanical devices called switches. The manual service method is the older of the two and is the method under which the majority of the telephone subscribers still receive telephone service.

Under the manual service method of operation telephone connections are established in a number of different ways "depending on the size of the exchange, the type of plant employed and the classes of service offered".(96) In some exchanges there is but one local office and the exchange is known as a "single office exchange". Where there are two or more local offices, the exchange is known as a "multi-office exchange". This latter type of exchange is found in the larger cities where there are more than ten thousand telephone station lines.

In the single office exchange only one switchboard is required and all the local calls are completed by one operator. In the multi-office exchanges, on the other hand, there are two switchboards in each central office. The calls are received by an operator at one of

(96) Reference 5, page 101

(95) Reference 39, page 5





### 3. LOCAL MANUAL OPERATION

There are two fundamentally different methods of handling local telephone calls. Under one method, the calls are all handled by an operator. This is called manual service. Under the other method, called dial service, the connections between the different telephone stations are established by means of mechanical devices called switches. The manual service method is the older of the two and is the method under which the majority of the telephone subscribers still receive telephone service.

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(96) Reference 5, page 101

(97) Reference 5, page 102





the switchboards, which is called the "A" board and completed by a second operator at a "B" board. Where the call is for another subscriber connected to the same central office, the "A" operator usually completes the call herself, but if the call is for a subscriber in one of the other central offices, the "A" operator will establish a connection to a "B" operator in the second central office, and the call will be completed by the "B" operator.

"There are two standard methods" of completing calls between different central offices, "known respectively as the 'call circuit' method and the 'straightforward' method".(97)

The call circuit method is the older of the two and is now largely being replaced by the straightforward method, which was introduced in 1925, in order to improve the speed and quality of the service. The tone of the service was also improved about the same time by the adoption of restricted repetition. Under this plan the operator, on receiving the telephone number from the subscriber, establishes the connections without repeating the number. At first this plan caused some confusion, but the subscribers soon became accustomed to hearing the operator say "Thank You" instead of repeating the number and, as the plan had the effect of improving their service, they welcomed the change. Observations made, before and after the plan was put into operation, showed that the percentage of

(97) Reference 5, page 103





calls, on which the subscriber received the wrong number, decreased slightly.

The adoption of straightforward trunking and of restricted repetition has also made it possible to release "a number of 'A' and 'B' switchboard positions" and, where "it was economical to do so", these positions were transferred to other offices to take care of growth.(98)

In order to accurately evaluate the results of these changes in operation and of the operators in general, the traffic management has for a number of years made periodic observations of the service which was being given by the operators. "For a number of years the primary problem was that of disclosing average results on routine traffic as a whole, but in recent years, the tendency to seek further improvement of service through attention to special phases of traffic operation, has led to a much broader appreciation of service observing and has focused attention increasingly on a wide variety of features".(99)

In making these observations and in analyzing the results, all the different factors of operation are given a proportionate weight and an index is derived showing the quality of the overall performance. This index is known as the local traffic index and the trend of this index is shown on Figure 14, on page 98. There has been a continued betterment in this index each year over the performance

(98) Reference 35, page 17

(99) Reference 35, page 20





## LOCAL TRAFFIC RESULTS

of the previous year. For the year 1928, however, the index figures show a drop from the figures of 1927 due to a change in the method of computing the index. If the same basis had been used in 1928 as was used in 1927 the index figure would have been slightly over 94 instead of 93 as shown on the chart.

The index has now reached a point where opportunities for improvement are becoming largely a matter of segregating from the mass of calls, "those calls which are not satisfactory handled and to determine those subscribers who are experiencing or causing the most service troubles".(100)

The traffic management in using these indices are aware that, while the service cannot be considered as good unless the index is good, the index does not give a complete picture and that there must be an effort made "to seek out all opportunities for improvement".(100)

## CAUSES OF UNCOMPLETED CALLS

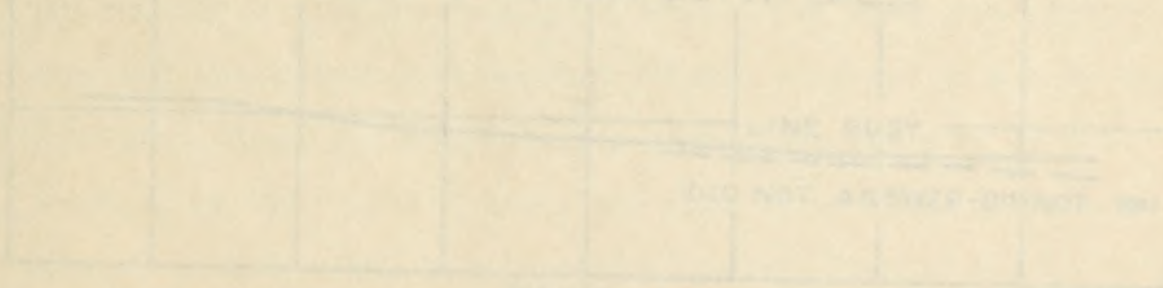


FIGURE 16

## PER CENT OF UNCOMPLETED CALLS DUE TO ERRORS

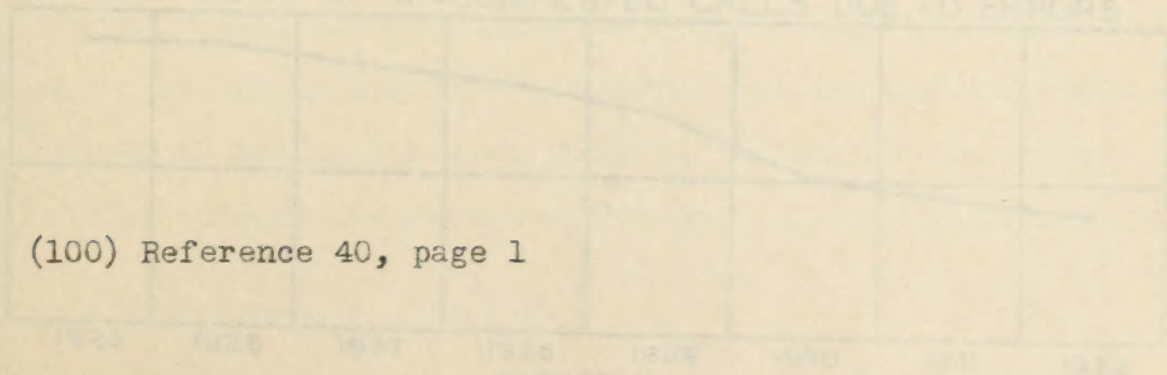


FIGURE 17

(100) Reference 40, page 1





# LOCAL TRAFFIC RESULTS

## BELL OPERATING COMPANIES

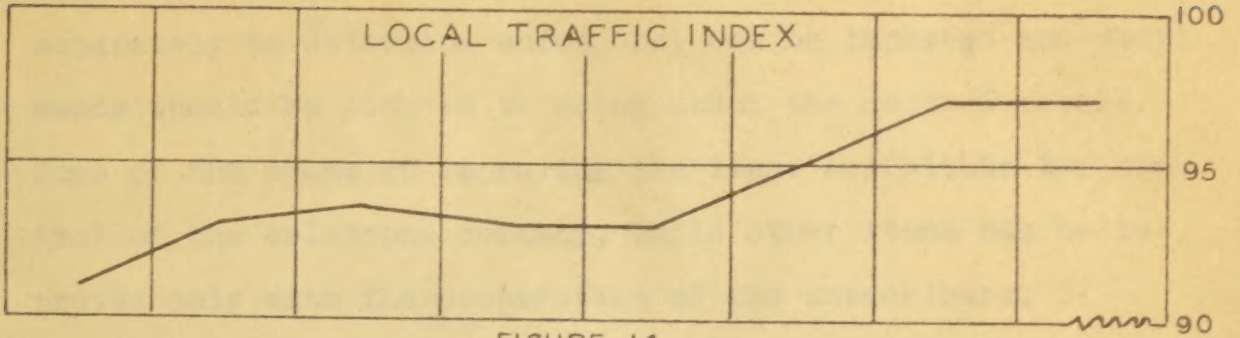


FIGURE 14

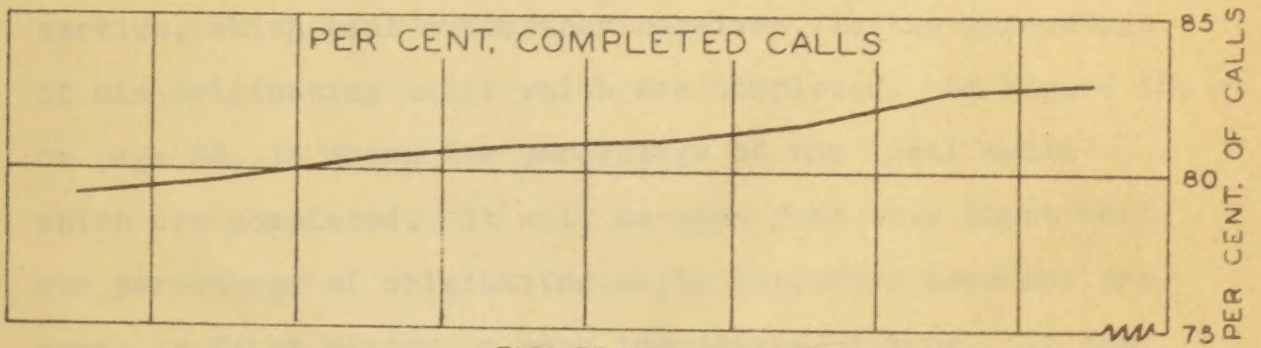


FIGURE 15

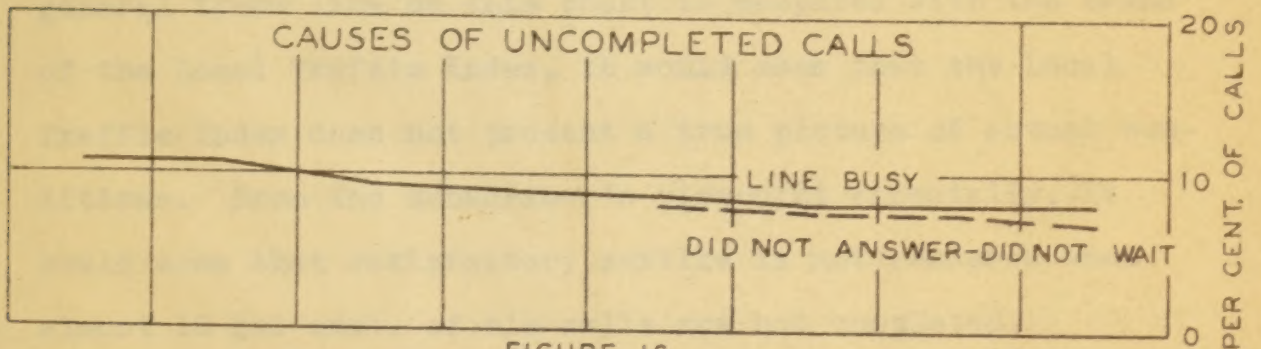


FIGURE 16

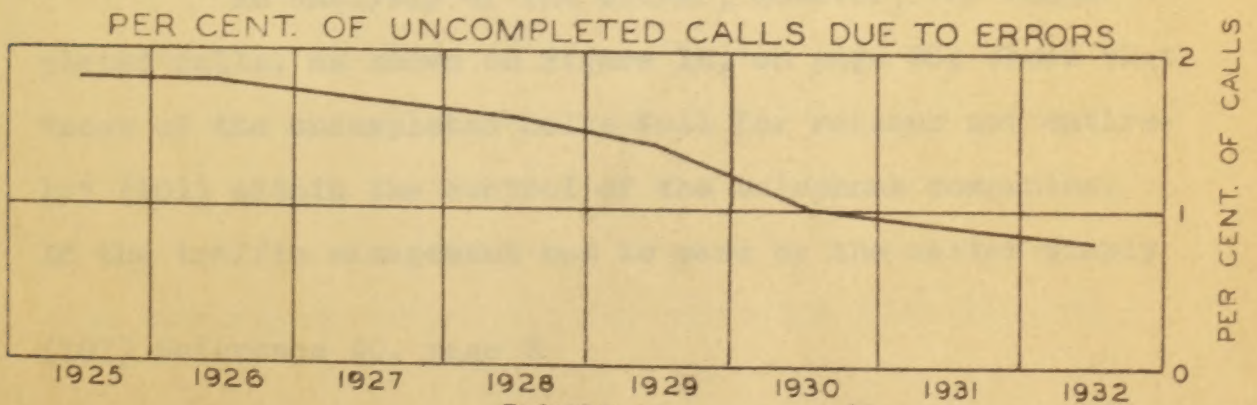


FIGURE 17





#### a. ACCURACY AND COMPETITION

In attempting to raise the technical index the different items used in making the index figure are analyzed separately to determine which ones can be improved and what means should be adopted to bring about the desired result. Some of the means of improving the items are within the control of the telephone company, while other items can be improved only with the cooperation of the subscribers.

One item which greatly affects the value of the service, which each subscriber receives, is the percentage of his originating calls which are completed. On Figure 15, on page 98, is shown the percentage of the local calls which are completed. It will be seen from this chart that the percentage of originating calls completed does not present, at first glance, a very impressive picture. If the general trend line on this chart is compared with the trend of the Local Traffic Index, it would seem that the Local Traffic Index does not present a true picture of actual conditions. From the subscriber's viewpoint especially, it would seem that satisfactory service is not rendered when almost 18 per cent. of his calls are not completed.

An analysis of the causes, however, for uncompleted calls, as shown on Figure 16, on page 98, shows that "most of the uncompleted calls fail for reasons not entirely" (101) within the control of the telephone companies.

If the traffic management was to pass by the matter simply





because the underlying cause was beyond its control it would not be fulfilling its obligation to provide the best possible service. Instead of assuming an indifferent attitude, the traffic heads have taken the aggressive in trying to improve the situation. Line reports, but has also effected an increase

The largest single factor for the failure of completion is the busy line condition. On first analysis it would seem that there is no apparent remedy for this situation. That an improvement is being made in reducing the number of uncompleted calls due to busy line conditions shows that attention is being given to the situation.

One of the methods used in decreasing the number of "busies" encountered, is to determine by analyses and special studies which subscribers or classes of subscribers cause the bulk of busy reports. From one of these studies it was found that nearly five per cent. of the calls to private branch exchange switchboards were not completed because all the trunk lines were busy. As the number of calls terminating at these private branch exchange switchboards varies in different central offices from twenty to forty per cent. of all the calls made, it is evident that this class of service is the cause of a large percentage of the busy line conditions. The results of these special studies are forwarded to the commercial department, and where the number of busy line reports seem to warrant it, the commercial representatives interview each subscriber and go over the situation with him. In





many cases the subscribers are unaware of the condition, welcome the information and have additional trunk lines installed to their switchboards. Where additional service is subscribed for, the special study has not only resulted in reducing the number of busy line reports, but has also effected an increase in revenues and a decrease in operating expenses.

Studies of busy line conditions are also made for those business subscribers who have individual or party line service. As a rule these subscribers are owners of small businesses and the prospect of paying more for their telephone service by subscribing for additional lines very often deters them from ordering the additional service. Where it is pointed out to them, however, that the failure to obtain a telephone connection may cause one of their customers to call one of their competitors, they realize that the additional cost may in some cases be offset by the profit made on some orders which may be lost if their customers received too many busy line reports. Many letters have been received from subscribers stating that the additional service had proven profitable.

In the case of residence subscribers, the problem cannot be solved by the same approach. "To a large degree", the busy line condition "is a matter of rate structure and rate treatment and, therefore, is not easily changed". (102) The problem, however, is being met by cooperation with the commercial department and the subscribers. The traffic de-





partment furnishes to the commercial department a list of cases where a large number of incoming calls are not completed because of a busy line. As a rule the cases involve party line service and, when the matter is called to the attention of the subscribers and they are informed that a more satisfactory service could be obtained at a very slight increase in cost, many change to a higher grade of service. The commercial department also initiates interviews on regrading work and makes use of every opportunity to regrade a subscriber upward. When a subscriber complains, for example, that the other parties on the line are making so many calls that he is unable to use the service, the commercial representative calls or interviews the different subscribers on that line, points out the limited advantages of their service and the more satisfactory service obtainable with a different type or grade of service.

The effect of these regrading activities is not only apparent in the betterment of the busy line condition, but also in a better distribution of subscribers by grades of service. The service of the rural line subscribers has also improved by decreasing the number of stations on each line from an average of almost 15 to an average of less than 8.

Another means which has been tried in some telephone companies and which has resulted in reducing the number of incompleting calls is the introduction of a slight time interval before reporting a line busy. When the opera-





tor notices that the called line is busy she waits a few seconds and tests the line a second time and reports the line busy only after the second attempt. Care must be exercised, however, in the use of this method. Many subscribers expect the same speed of completion on all local calls and, if there is a slight delay before a busy report is given or before they hear the ringing signal, they may feel that the operator is not attempting to complete the call. This method, furthermore, is not used during the busy hour periods as it would delay the completion of many other calls.

The second greatest factor causing uncompleted calls is the 'don't answer' and 'did not wait' type of calls. As the phrases indicate, these are calls where the called subscriber did not answer or where the calling subscriber did not wait long enough before abandoning the call.

Analyses of these calls were also "made in many of the larger cities and in some of the smaller ones" and the results showed "that on the average about 1.5 per cent. of the calls are due to the calling subscriber not waiting a sufficient length of time and about 1.0 per cent. are the result of plant or traffic faults".(103) It will thus be seen that through cooperation with the subscribers and by correction of the plant and traffic faults, the number of completed calls could be increased by about 2.5 per cent. In some cases of 'did not wait', it was found on inspection that the location of the bell or of the telephone at





the called subscriber's premises resulted in slow answering and with the cooperation of the subscriber it has been possible in some cases to decrease the number of these uncompleted calls by moving the bell or telephone to a better location or by providing the subscriber with extension service. Plans were also undertaken with the aim of educating the calling subscribers to wait a sufficient length of time before hanging up and the called subscribers to answer the call with sufficient promptness. These plans took the form of newspaper publicity, directory notices and employee contacts with customers.

In most of the cases of 'don't answer' calls, it was found, by calling the subscriber at a later time that there was no one at the premises at the time. "As an aid in developing the possibilities in the way of arrangements" to decrease the number of don't answer calls, because there is no one to answer, "experiments are being carried on with a form of 'leave word bureau', at which subscribers may arrange to have calls answered in their absence. Along this same line physicians' bureaus are being operated in several cities".(104) In general, however, these special features appeal only to a small group of subscribers, but, as they improve the general service of all the subscribers and are meeting the exacting service requirements of certain classes of subscribers, these experiments have seemed warranted.

In attempting to decrease the percentage of calls





which are not completed due to traffic and plant faults, conferences are held periodically at which all the operating departments are represented. The matter is thoroughly discussed from the departmental viewpoints with the result that greater attention is being given to the methods of training and supervision and to revisions in the operating practices.

The third most important cause of uncompleted calls is 'operating errors'. Unlike the busy line and don't answer situation this item is largely within the control of the telephone companies and is a factor which more seriously affects the general quality of the service from the subscriber's viewpoint. "Of all the complaints on rated items 82 per cent. are on errors".(105) Although this would seem to be a very high percentage, it is not an accurate measurement of the service which is being given since this item affects less than 2 per cent. of all calls. It serves to show, however, that even though the general service may be of high grade, the subscribers are particularly annoyed by some individual case of poor service.

The method employed in meeting this problem is largely one of more comprehensive training and supervision and periodic reviews and revisions in the methods of service observing, so that a more complete picture may be obtained of the causes of the different types of errors. A method which has been found fruitful was the segregation "from the mass, of those calls which are not satisfactorily





handled and to determine those individual subscribers who are experiencing or causing the most service trouble".(106) In connection with this method of providing a more satisfactory service, there has been instituted a plan of having the subscriber notice that the general service is of a high grade, so that "when he does encounter inevitable cases of poor service, he will have a mental picture of general good service which will give the poor service its proper perspective".

(107) "The first step" in this plan "was to improve the operators' tone of voice in such a way that it was noticeable to the subscriber".(107) A group of instructors and chief operators were first assembled and from "a large mass of technical material on voice technique they selected three principles of voice expression and ten regular operating phrases to which major attention would be given".(107) They also "determined the best way to enunciate the various phrases" and "started intensive voice work with the operators and supervisors".(107) In order to make the plan appeal to the operators each chief operator had a thirty minute discussion with groups of three operators, "at which she endeavored to arouse their interest in the possibilities of so rendering the service that its general excellence would be noticeable to their subscribers".(108)

"A marked improvement in the general tone of voice

(106) Reference 40, page 1

(107) Reference 41, page 1

(108) Reference 41, page 1





in all offices was noticed" and, although "the extent of this improvement could not be accurately measured, an increased number of comments was received from subscribers expressing satisfaction with the way in which operators were handling their calls".(109) These comments from the subscribers were acknowledged by the supervisors who, at the same time, "tried to get across the idea that the subscriber would always experience occasional service difficulties, but he would be certain of the operator's desire to reduce such cases to a minimum".(110) The operators and supervisors, as a result, "got an entirely new picture of the state of mind of subscribers" and "it gave them renewed encouragement to continue the various things which were being done towards personalizing the service".(111)

As shown on Figure 17, on page 98, it is evident that the plans to reduce the percentage of errors have produced good results. The progress is gradual, however, but as it involves but a small percentage of the total calls, it is a step in the improvement of the general service.

The percentage decrease in the uncompleted calls has been slight, but, when consideration is given to the fact that each increase of 1 per cent. in the number of completed calls means that 250,000,000 more calls are successfully completed, the "accomplishment emphasizes the service value accruing from relatively small gains and indicates the importance" which the

(109) Reference 41, page 2  
(110) Reference 41, page 3  
(111) Reference 41, page 4





traffic department heads attach to "continuous attention to completion activities". (112)

This improvement in the general service has generally been accomplished without increasing the operating costs, as the operating time which has been saved and the revenue increases which have resulted have about offset the additional expense of securing the data and planning the methods of improvement. The necessity for the information positions is

apparent when it is realized that approximately 50 per cent. of the subscribers each year either have service installed or disconnected, or move from one location to another in the same or a different exchange office. As the telephone directories are printed only every six or eight months, and in some cases only once a year, it is important that the data regarding these changes be readily available at some central point for all the subscribers in the system. From time to time the different Associated Companies have made "experiments" with frequent reprinting of the subscribers' directories with a view toward reducing the number of "times" (114) that it is necessary to consult the information operators. The costs of frequent reprinting of directories have been compared with the costs of information service and time intervals for directory issues are based on the relation of these costs and the slight inconvenience to the subscribers in calling the information operators.

When subscribers do call the information operators

(112) Reference 42, page 7

(114) Reference 25, page 8





b. INFORMATION SERVICE

"One or more central offices in every exchange are equipped with special switchboard positions used for information service. The information operators are provided with complete lists of customers' names, addresses and telephone numbers, arranged for ready reference, from which they supply information to customers on request".(113)

The necessity for the information positions is apparent when it is realized that approximately 20 per cent. of the subscribers each year either have service installed or disconnected, or moved from one location to another in the same or a different central office. As the telephone directories are printed only every six or eight months, and in some cases only once a year, it is important that the data regarding these changes be readily available at some central point for all the subscribers in the System. From time to time the different Associated Companies have made "experiments with frequent reprinting of the subscribers' directories with a view toward reducing the number of times" (114) that it is necessary to consult the information operators. The costs of frequent reprinting of directories have been compared with the costs of information service and time intervals for directory issues are based on the relation of these costs and the slight inconvenience to the subscribers in calling the information operators.

When subscribers do call the information operators

(113) Reference 5, page 104

(114) Reference 38, page 8





it is necessary that they obtain accurate and reasonably prompt service. In furnishing prompt service, two factors are considered, namely that the subscriber reach an information operator promptly and that the information desired be furnished promptly. Service observations have been made on these two items for a number of years and real improvement has been obtained in the service given as shown on Figure 18, on page 111. In trying to improve the promptness of answer, it is essential that there be "general uniformity of answer rather than fast answers"(115) on some of the calls and slow answers on others. To accomplish a general uniformity of answer a special circuit was developed in 1927 which was called the 'flashing signal circuit'. "When there are several unanswered calls due to a sudden overload, this circuit arrangement indicates the delay by flashing the particular signals which have been unanswered for more than a certain number of seconds".(116) As a further improvement a new information board was "developed to permit calls to be automatically distributed to idle operators in the order received" (117) and then to store calls "in order and later distribute them to operators as they become idle".(116)

Improvement in the time required to furnish the information desired by the subscriber has also been effected, even though in recent years there has been a higher

- (115) Reference 38, page 8
- (116) Reference 38, page 9
- (117) Reference 35, page 14





## AUXILIARY SERVICES

## BELL OPERATING COMPANIES

## INFORMATION SERVICE

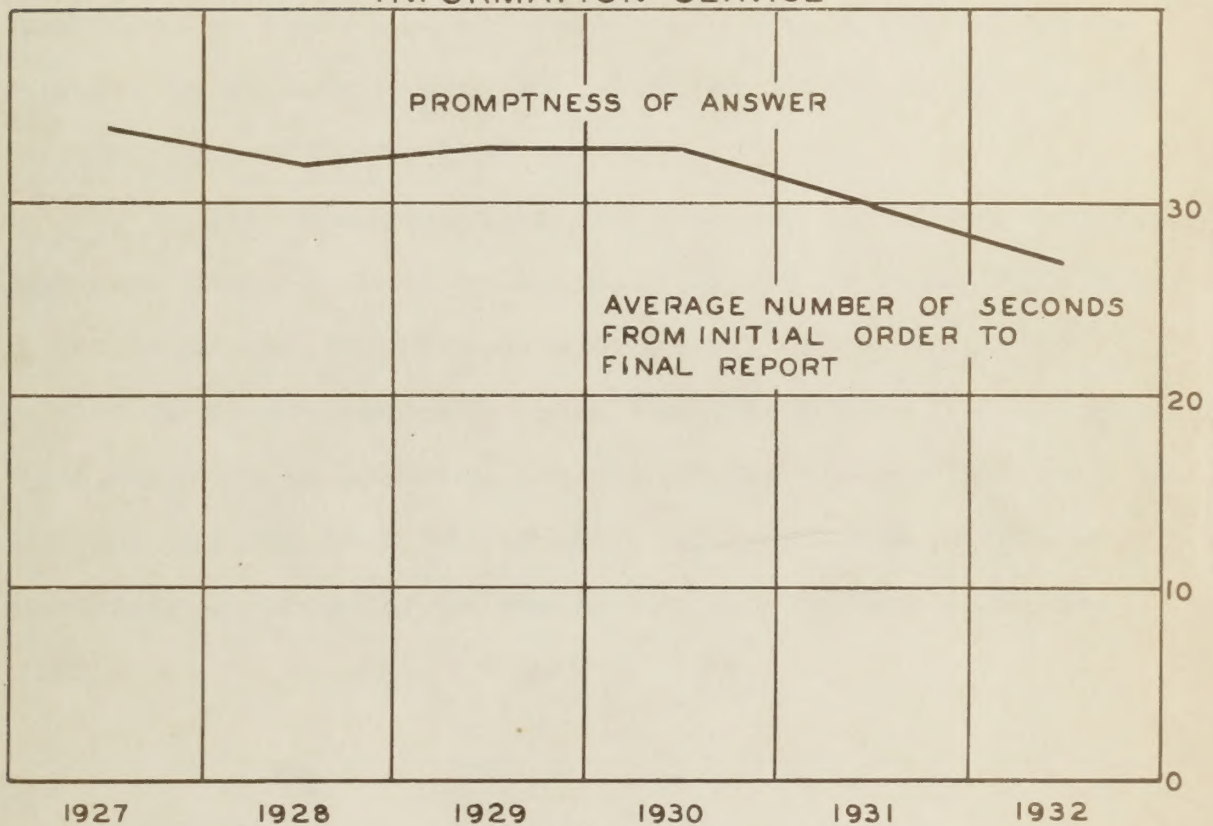


FIGURE 18

## INTERCEPTING SERVICE

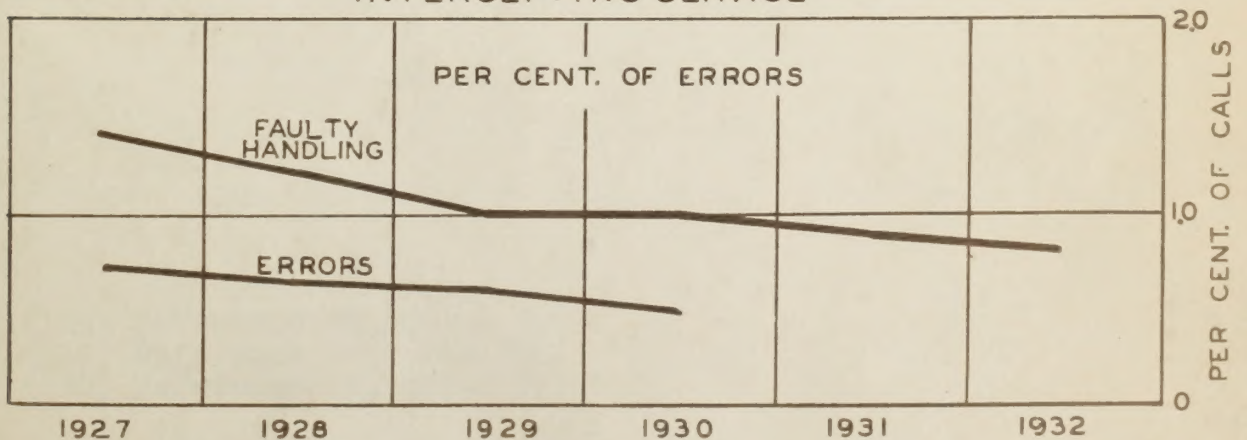


FIGURE 19





number of calls to information due to the "increase in station turnover".(118) This improvement was brought about by furnishing the local information operators with a reasonable number of directories to satisfy adequately a very high percentage of the requests for out-of-town numbers, and by establishing central directory bureaus "at key points from which operators at other nearby centers may obtain the telephone numbers in distant cities for which no directory is provided in their own office".(119)

The improvement in the accuracy in information work has been brought about principally by closer attention to the training of the information operators. The service was also placed on a more personal basis "by simplifying the information practice by allowing the subscriber to give his call in his own way and then asking only such questions as may be necessary to properly determine the information desired".(120)

careful attention".(120)

In connection with such types of calls it was formerly the practice to ask the subscriber to recall the local operator. This practice is gradually being changed and plans are now under way to provide interesting opera-

(118) Reference 42, page 104

(118) Reference 42, page 7

(119) Reference 38, page 16

(120) Reference 38, page 9





### c. INTERCEPTING SERVICE

When an "operator receives a call which cannot be completed due to such reasons as changed, disconnected or vacant numbers, she deflects the call to an intercepting operator, who explains the particular situation to the calling customer".(121)

When such calls are deflected it is important that the subscriber encounter no unreasonable delay in being informed of the correct situation. Service observations are also made periodically of these calls and analyses of the data are carefully reviewed to determine the methods to be taken for improving the service. The progress made in recent years in raising the quality of this service is shown on Figure 19, on page 111. As a rule these calls are annoying to the subscribers until they have been told the reason for the delay in completing their call. "The most annoying type of intercepted calls are those improperly intercepted", that is, those calls which should not have reached an intercepting operator. When such instances do occur "it is obviously very important that they be given prompt and careful attention".(122)

In connection with such types of calls it was formerly the practice to ask the subscriber to recall the local operator. This practice is gradually being changed and plans are now "under way to provide intercepting opera-

(121) Reference 5, page 104

(122) Reference 35, page 14

(123) Reference 35, page 18





tors with equipment arrangements which will permit them to complete intercepted calls" (123) themselves without referring the subscriber to the local operator.

There are two standard types of dial systems in use: the 'panel' type which is usually used in large metropolitan areas, and the 'step-by-step' type which is found in single office exchanges and in multi-office exchanges having a small number of central offices. From the subscriber's standpoint there is no difference in the operation of the two types of systems. (124)

Dial service was first introduced in the Bell System in 1893. Since that time the number of stations on a dial basis has been increased gradually till at the end of 1932 it totaled over 5,000,000 stations or 49.5 per cent. of the telephones in the Bell System. The number of calls originated daily from dial stations and from non-dial stations bear approximately the same ratio. During 1932, there were approximately 76.3 million local calls originated daily from all stations, and of this number thirty-two million calls or 42 per cent. were originated from dial stations. It will be seen from these data that dial service is as important as it is in local operating as general service and that it is gradually assuming a more important aspect from a service standpoint.

From the large number of conversions of stations from manual service to dial service, one would naturally





#### 4. DIAL OPERATION

A dial system is essentially the same as a manual system except that the operators are replaced by mechanical switches. There are two standard types of dial systems in use; the 'panel' type which is usually used in large metropolitan areas, and the 'step-by-step' type which is found in single office exchanges and in multi-office exchanges having a small number of central offices. From the subscriber's standpoint "there is no difference in the operation of the two types of systems".(124)

Dial service was first introduced in the Bell System in 1920. Since that time the number of stations on a dial basis has been increased gradually till at the end of 1932 it totaled over 5,850,000 stations or 42.5 per cent. of the telephones in the Bell System. The number of calls originated daily from dial stations and from non-dial stations bear approximately the same ratio. During 1932, there were approximately 74.3 million local calls originated daily from all stations, and of this number thirty-two million calls or 43 per cent. were originated from dial stations. It will be seen from these data that dial service is as important an item in local operating as manual service and that it is gradually assuming a more important aspect from a service standpoint.

From the large number of conversions of stations from manual service to dial service, one would naturally





presume that there will be a reduction in the number of operators which will be required. It is estimated, however, that when the dial conversion program is completed "the number of operating employees will be substantially higher than at present. In this increase, the rapidly growing toll and long distance business and the handling of information calls and special services are largely factors". (125)

In reviewing the progress which has been made by the operating forces in improving the service of the telephone users it is not possible to obtain as complete a picture as in the case of manual service. Service data on dial service have been taken from its introduction in the Bell System but these data were not summarized prior to 1925, as the small number of calls on which the data were obtained was not significant of the general condition. Since 1925, however, the data have been more complete and the methods for improving the service are being revised continually. The two principal features of dial service which are closely scrutinized and on which the traffic management feels that it should concentrate its attention are: (a) Faulty Usage and Equipment Reactions, and (b) Assistance Traffic. Data are also gathered on the percentage of calls completed and the methods used to increase this feature of the service are similar to the methods used under manual service.

(126)

(127) Reference 28, page 29

(128) Reference 28, page 29





a. FAULTY USAGE AND EQUIPMENT REACTIONS.

Faulty Usage and Equipment Reactions are two of the major service features of dial operation. Although the causes for these two classes of service failures arise from entirely separate sources, they are considered under one heading because when taken together they show the percentage of dial calls which are not completed or which encounter a delay in completion. With the growth in dial systems and "while upwards of 95 per cent. of dial traffic is handled without operators being involved to any particular extent" (126) these two factors are given careful management consideration in order that the overall performance under dial service may be more satisfactory than under manual. As there is such a small percentage of the dial traffic involved, the improvement can be but slight from year to year. Over a number of years, however, the improvement is noticeable in both features.

"The continued improvement in subscribers' faulty usage is particularly encouraging in view of the large number of stations that are cut over year by year which previously operated on a manual basis".(127) This improvement has been due principally to "improved supervision and more careful selection of instruction prospects", and also in part to the "increasing familiarity with the dial". (128)

(126) Reference 35, pages 22-23

(127) Reference 38, page 10

(128) Reference 42, page 7





Under equipment reactions are combined all the service failures due to central office, outside plant and operating reactions. The percentage of calls affected is so small that "they can be shown graphically only by using an enlarged scale".(128)

The results of the efforts made to improve these two features of dial service are shown on Figure 20, on page 119. An interesting angle of the improvement in the trend of these features is obtained when it is realized that "the reduction in that portion which reflects failure to reach the desired station meant the better handling of some ten million calls in 1932".(128)



FIGURE 20

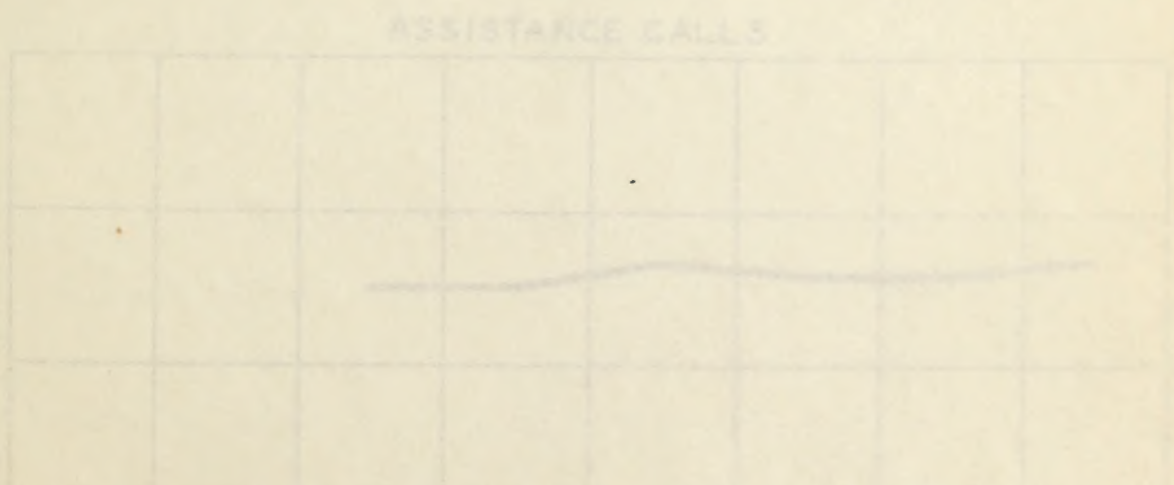


FIGURE 21

(128) Reference 42, page 7





## DIAL SERVICE

## BELL OPERATING COMPANIES

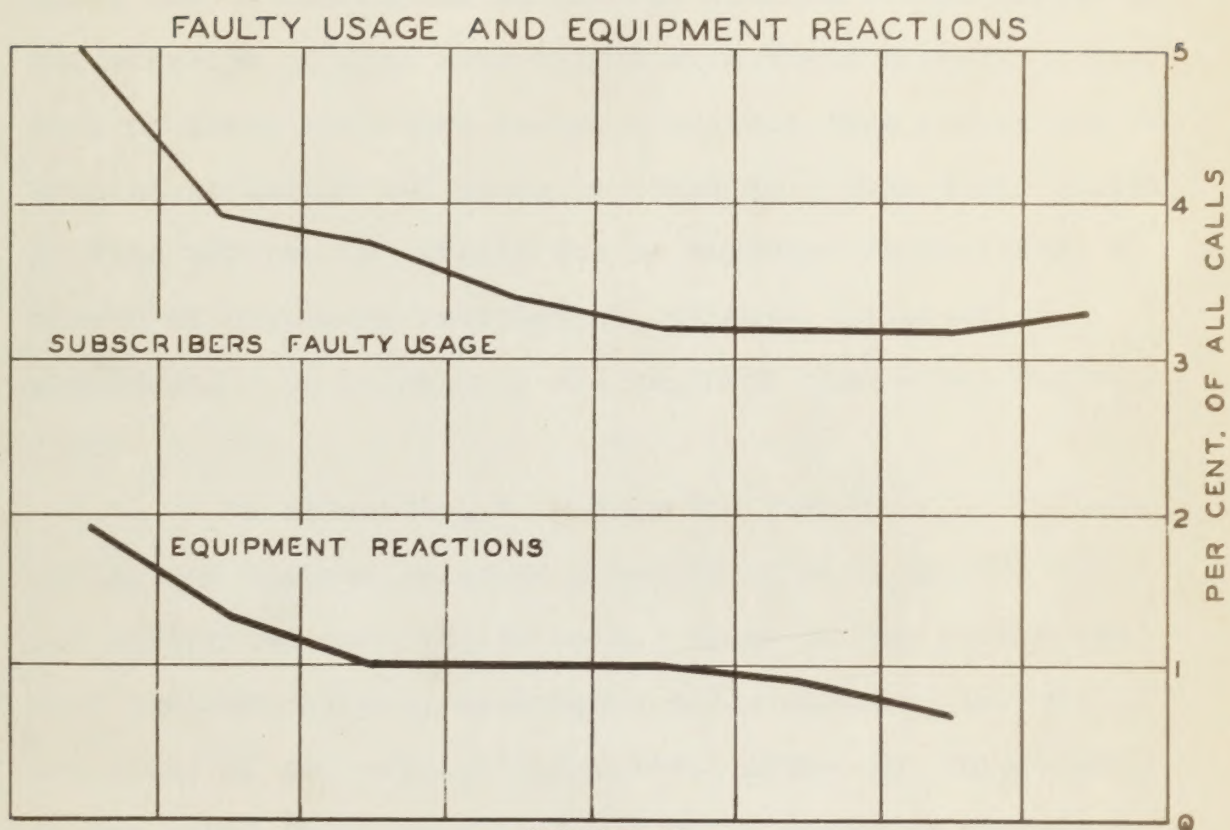


FIGURE 20

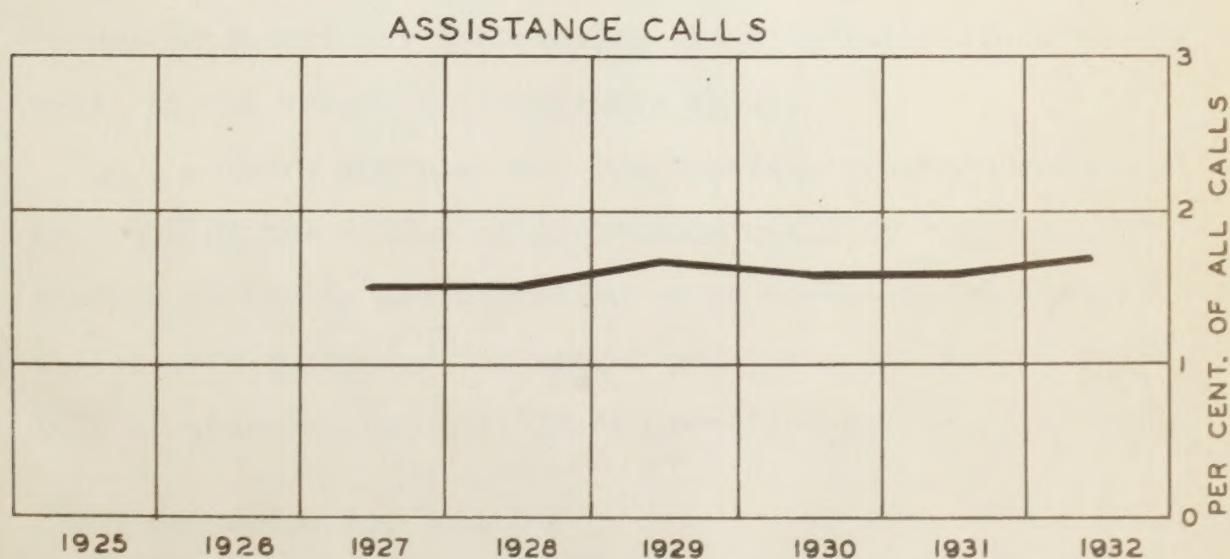


FIGURE 21





## b. ASSISTANCE TRAFFIC

The volume and the quality of assistance traffic is also an important feature of dial service as it is felt that "to some extent, at least, the volume of assistance calls may be considered an inverse measure of the degree of satisfaction of dial subscribers with their service". The data on these calls are analyzed so that "the causes may be brought to light" and means provided to reduce their number. As "the problem is largely one of customer instruction, a number of companies established definite organization arrangements to coordinate all customer instructor work".

(130)

In attempting to reduce the number of assistance calls, one company selected a number of message rate lines for subscriber instruction work. Prior to the interviews with the subscribers, assistance calls amounted to over 12 per cent. of the originating calls. After the interviews, it was found that the assistance calls amounted to only 7 per cent. of the total. On a group of flat rate lines the result of subscriber instruction showed a decrease of 40 per cent. in the volume of assistance calls.

Where the plan was practicable, progress was made in reducing the volume of assistance calls by "having dial traffic requiring the attention of an operator, handled on toll boards instead of on manual positions in dial offices". This arrangement resulted in "a reduction in the small teams





of operators, fewer codes to be used by customers and general improvement in service".(131)

The improvement in this service feature, as shown on Figure 21, on page 119, has also been gradual and, with the yearly increases in the number of subscribers cut over to dial service, the traffic department heads are continually revising the local operating practices so as to maintain the overall volume of assistance calls at a minimum.

The 'toll switching trunk', employed directly in establishing toll connections between the toll office and the "B" switchboards, and the 'toll recording trunk' by which a calling subscriber is connected by the "A" operator to the toll operator.

When a subscriber places a toll call to a "A" operator, she connects his line to a toll-recording trunk to the GLK toll operator. The latter learns from the subscriber or from the "A" operator the subscriber's telephone number or the name and address of the party he wishes to reach. She writes this information on a toll ticket, asks the customer to hold the line and attempts to complete the call at once.

Her first operation in doing this is to connect another cord to an idle trunk to the called city, ring the distant inward operator and pass her the called number. She then connects the other end of the cord circuit to an idle toll switching trunk to the "B" switchboard of the calling party's local central office and directs the "B"

(131) Reference 35, page 22

(132) Reference 3, page 104





## 5. TOLL OPERATION

The method of operation in establishing "long distance or toll calls is somewhat different from the method of establishing local connections". The method of handling toll calls "now in general use is known as the 'combined line and recording' or CLR method of operating".(132)

"Two classes of trunks connect the toll office with each local office in the area which it serves", (132) the 'toll switching trunks', employed directly in establishing toll connections between the toll office and the "B" switchboards, and the 'toll recording trunks' by which a calling subscriber is connected by the "A" operator to the toll operator.

When a subscriber passes a toll call to an "A" operator, she connects his line to a toll recording trunk to the CLR toll operator. The latter learns from the subscriber or from the "A" operator the subscriber's telephone number or the name and address of the party he wishes to reach. She writes this information on a toll ticket, asks the customer to hold the line and attempts to complete the call at once.

"Her first operation in doing this is to connect another cord to an idle trunk to the called city, ring the distant inward operator and pass her the called number. She then connects the other end of the cord circuit to an idle toll switching trunk to the "B" switchboard of the calling party's local central office and directs the "B" (132) Reference 5, page 106





operator to connect the other end to the calling party's line. Upon completion of this operation, there are two parallel connections between the CLR toll operator and the calling subscriber's line. The object in holding the recording trunk connection until after the switching trunk connection is completed is to hold the subscriber's line and protect against a possible error in the latter connection, in case the CLR operator should misunderstand the calling customer's number or should make an error in writing it on the ticket".(133)

"In the meantime, the operator at the distant city will have established a connection over a toll switching trunk to the called customer's line. When he answers, he is connected directly through to the calling party and conversation can start at once. The operator at the calling city listens on the circuit to make sure that conversation has started and then stamps the back of the ticket to show the starting time". When she receives a signal "that the calling party has hung up, she again stamps the ticket and takes down the connection".(134)

As in the case of the local operators "the technical efficiency" of the toll operators "is measured by a composite index figure known as the 'Toll Traffic Index'. It is based on the speed with which certain steps in completing a call are performed, and the accuracy with which

(133) Reference 5, page 107

(134) Reference 5, page 108





certain work is done".(135) The trend of the Toll Traffic Index since 1924 is shown on Figure 22 on page 125.

Some of the operating functions which are used in computing this index are the percentage of calls completed, the average speed of completion, the percentage of calls on which the customer is held on the line and the percentage of calls on which there are service errors or unsatisfactory transmission. The Toll Traffic Index, as shown on Figure 22, shows a decrease of two points for the year 1928 as compared with 1927. This decrease was "due to a change in the index plan in 1928 which broadened the scope of measurement and made a high index somewhat more difficult of attainment". (136) Even with this change, however, the data show a further improvement the following years over the performance which was obtained under the previous index plan.

(135)Reference 5, page 114

(136)Reference 35, page 3





## TOLL BOARD SERVICE

## BELL OPERATING COMPANIES

## TOLL TRAFFIC INDEX

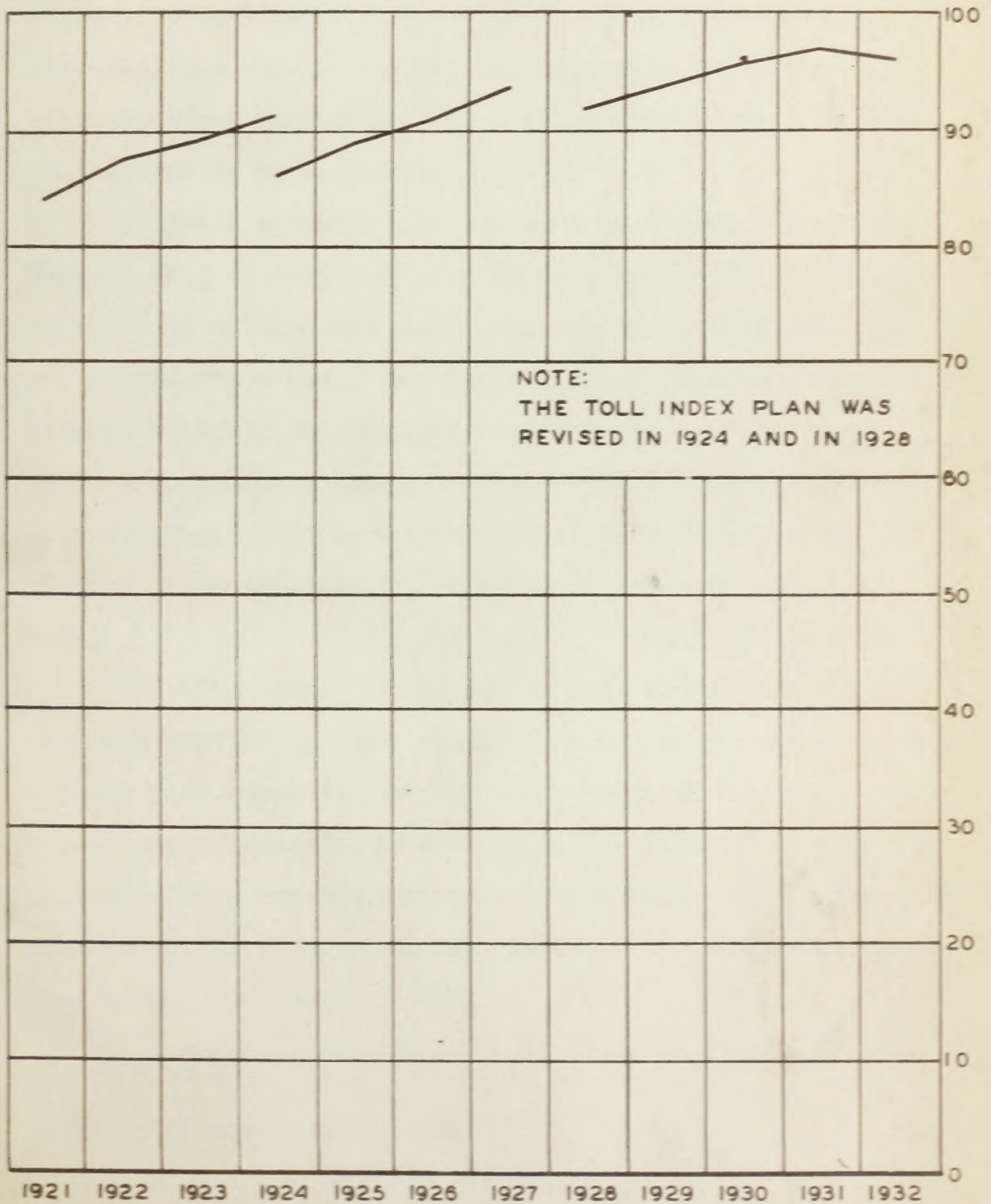


FIGURE 22





a. TOLL BOARD SERVICE

As in the case of local calls the percentage of originating toll calls completed determines the degree of service which the subscriber is receiving. If only 50 per cent. of his toll calls are completed, the subscriber may reasonably feel that he is receiving good toll service only half the time. The greater number of times that his toll calls are completed, the more pleased he will be with the service he is receiving.

When a subscriber places a toll call, it often happens that the called party is busy or does not answer. In such cases "the toll operator releases the calling party subscriber and after three minutes makes another attempt to complete the call. If this fails, she tries again after another three minutes. After a fourth unsuccessful attempt, she sends the ticket to a 'point-to-point' outward position where all subsequent attempts are made".

(137)

"The method of computing toll completion objectives was revised in 1928 so as to more nearly reflect present day performance". During 1928, "attention was also directed to the necessity of educating the entire traffic organization in a correct attitude toward toll board completion to make sure that efforts in this direction do not cause annoyance to the customer". (138)

During 1931 and 1932, as shown on Figure 23, on

(137) Reference 5, pages 108-109





page 128, 91 per cent. of the toll calls were completed. The traffic management feels that the "performance has been brought to a point where unsatisfactory reactions might result from the pressure of further improvement". (139)

The second most important factor in toll board service is the speed with which the connection is established. The steady increase in the speed of handling toll calls is shown on Figure 24, on page 128. Several operating changes have contributed to the improvement of this item. One important change, and a radical change in operating methods, was the introduction of the CLR method. Another change in the operating methods involved the decentralization of the toll traffic in the case of short haul calls. All toll calls were formerly handled by toll operators. With the rapid and steady increase in the number of toll calls to near-by points, inter-office trunks were installed between the "A" switchboards and the "B" switchboards of the offices between which there was a fairly large number of calls. By this change it became possible for the local "A" operators to complete a large number of toll calls without going through a toll switchboard and with the same speed as a local call.

A third method used in increasing the speed of service was to increase the number of cases where the subscriber is held on the line while the operator is trying to complete the call. In some cases it is necessary to release the sub-

(138) Reference 35, page 24

(139) Reference 35, page 3





# TOLL BOARD SERVICE

128

## BELL OPERATING COMPANIES

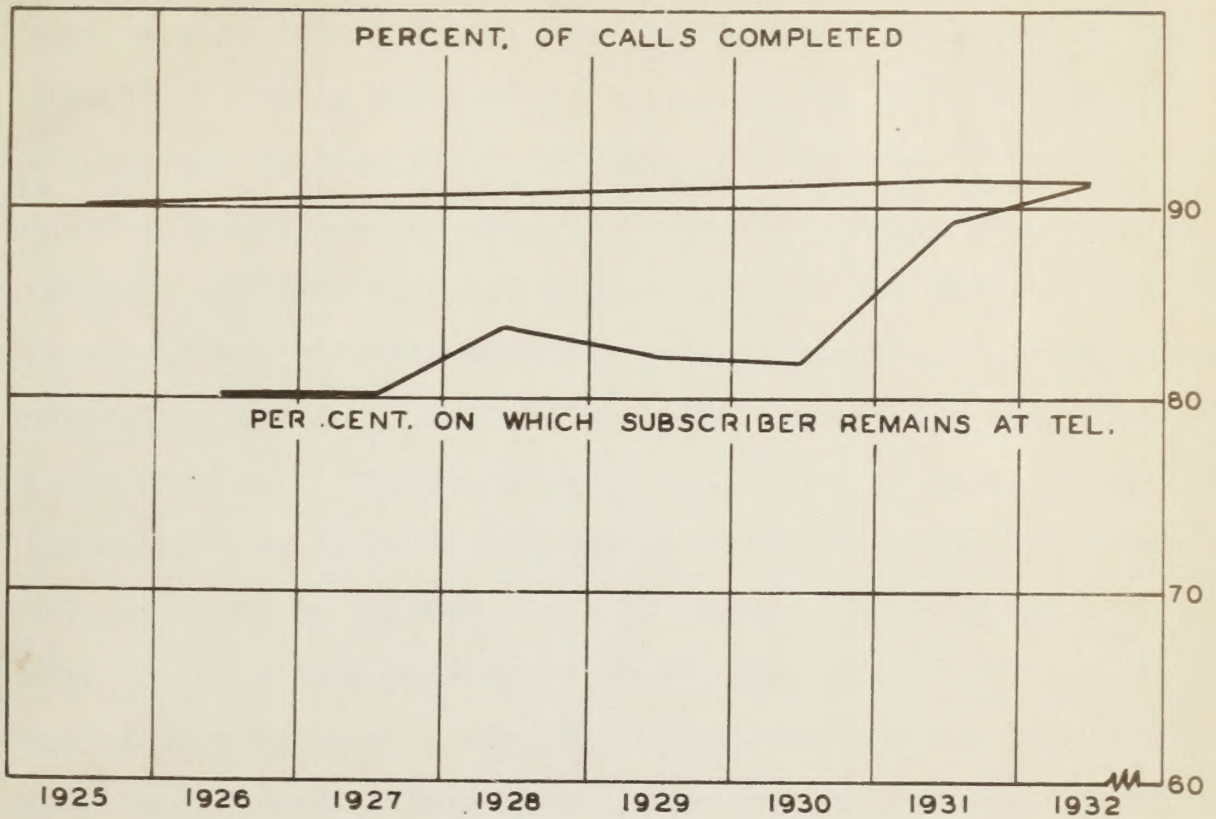


FIGURE 23

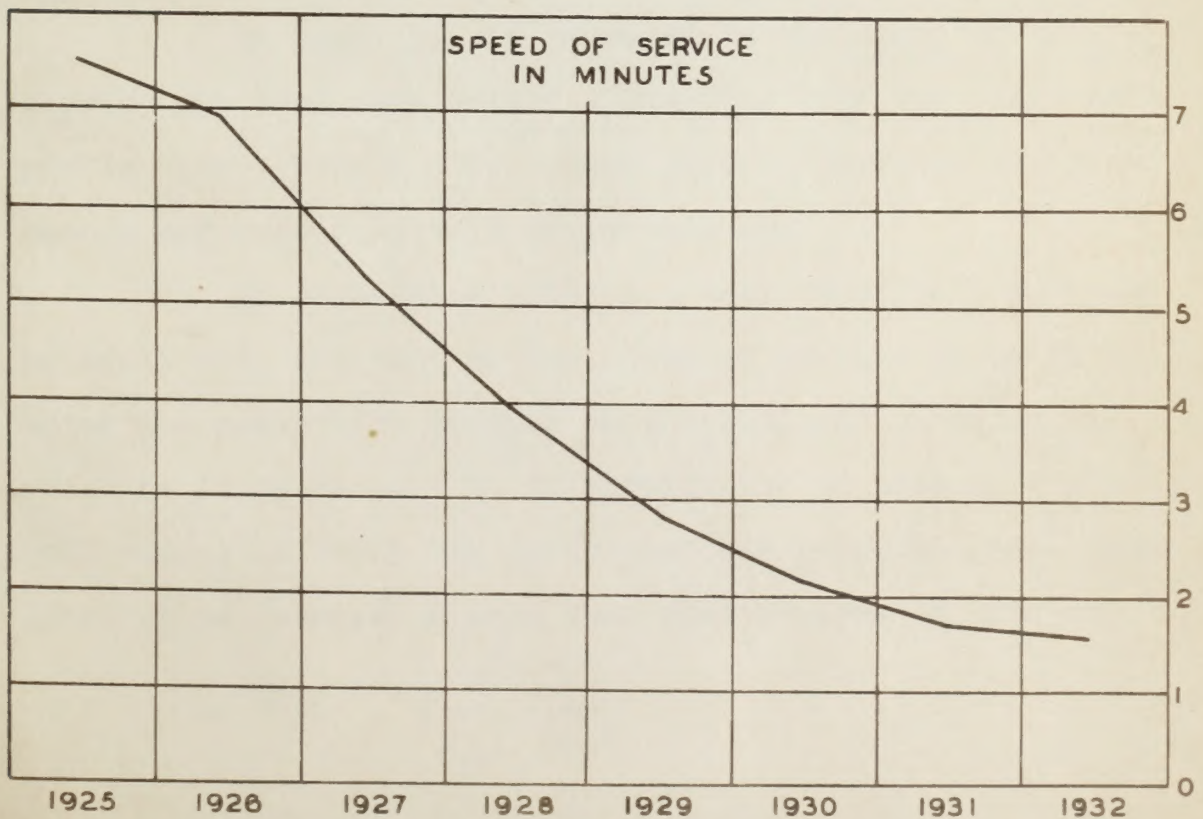


FIGURE 24





scriber and call him back later, as, for example, where there are no idle circuits to the called city or where directory work must be done. A decrease in the number of cases of 'no circuit' is being effected gradually by the installation of additional circuits where the amount of revenue to be received warrants the investment of capital. Where the expected revenue, however, does not seem to warrant the installation of additional circuits directly between the cities, alternate routes are set up to be used when the circuits on the primary route are busy. The decrease in the number of cases where the subscriber is released, due to directory work, is being brought about in certain cases by passing the name and address of the called subscriber to the operator in the distant city and by setting up direct circuits between the toll boards and the information positions. Some success has also been obtained in educating the subscribers of the desirability of placing their toll calls by number.

In general, the increase in the speed of toll service has been very marked during the last ten years and now is approaching a point where further increase may prove costly and more difficult of attainment.

In connection with this feature of toll service, separate data are kept of the speed of service on calls on which the subscriber is held on the line and on calls on which he is released. It is interesting to note that the toll calls, on which the subscriber was released, were completed on an average in less than four minutes in 1932 as





compared with an average of about seven minutes on all toll calls eight years ago. "Measuring the efficiency with which the plant is used by the messages per circuit mile and making necessary allowances for changes in the characteristics of the business, it appears, that the toll plant is now being used as effectively as it was in 1925 when the slower speed results were being obtained".(140)

The increase in the number of calls completed and in the speed of service have also been accompanied by an improvement in the quality of the operating and of the transmission. For the greatest part toll service will continue to be handled by operators, and as the local service and short haul service is gradually changed to dial, the subscribers will become more and more critical of the quality of operating on the toll calls handled by operators. This reaction is being anticipated by giving greater attention to the training and supervision of the toll operators so that there has been a continual improvement in the overall quality of toll service and a gradual decrease in the percentage of errors on toll calls as shown on Figure 25, on page 131.

"With the radical changes which have taken place in the speed of service, transmission has become a more controlling factor in the mind of the subscriber in fixing his overall judgment" (141) of this service. When subscribers waited on an average of seven minutes for a call

(140) Reference 43, page 5

(141) Reference 35, pages 15-16





## TOLL BOARD SERVICE

BELL OPERATING COMPANIES

## PER CENT. OF ERRORS

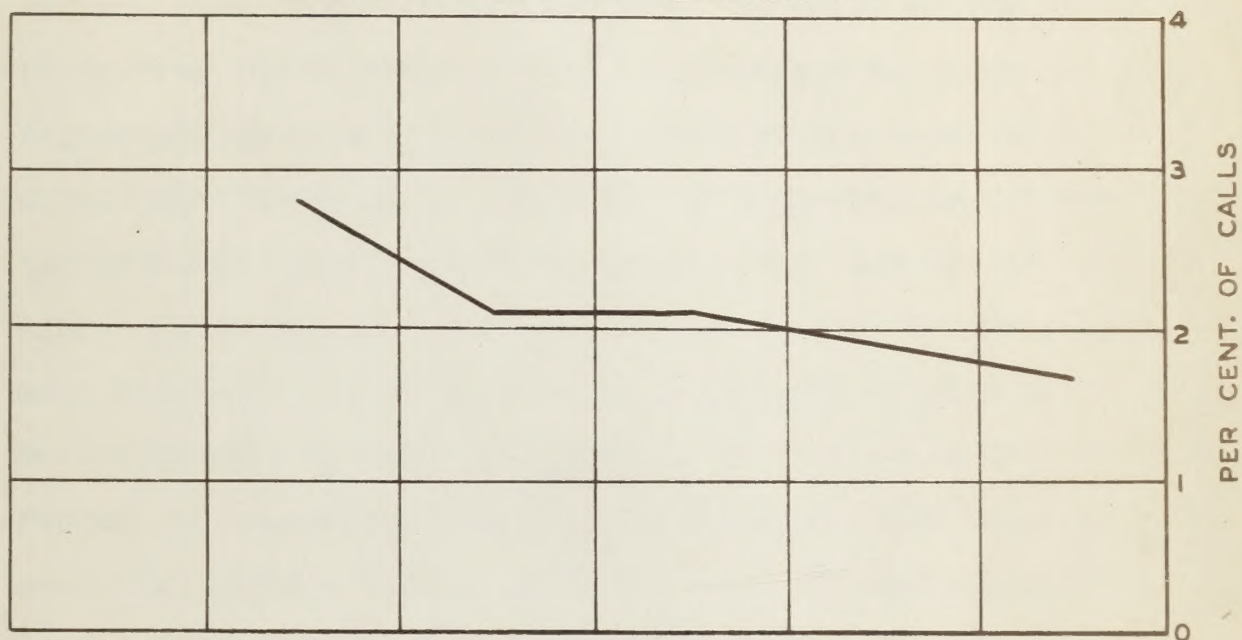


FIGURE 25

## UNSATISFACTORY TRANSMISSION

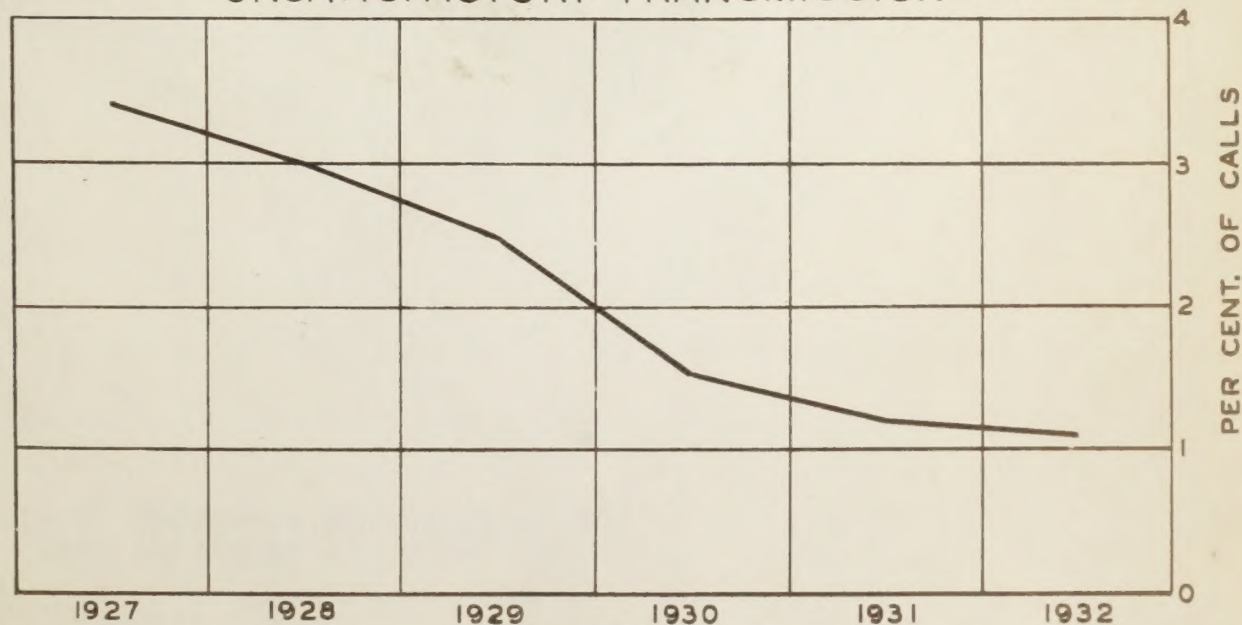


FIGURE 26

# TOE BOARD STUDY

2011-2012

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2011-2012

2011-2012



2011-2012



to be completed, "this delay in itself suggested difficulties and may well have fostered considerable patience with such occurrences as low grade transmission and interruptions".(141) In order to obtain more complete data on the quality of transmission, a special service observing plan was put into operation during 1927. By means of the data found from these observations, improvements as shown on Figure 26, on page 131, were effected on the types of calls where there was a low grade of transmission. These improvements largely resulted by changing some of the equipment on the toll circuits and by developing new routes, when the calls had to be routed through two or more toll switching offices. The "continued improvement in this feature of the service has done much to increase the general satisfaction with quality of long distance communication. The progress since 1929 resulted in better conversation on more than 1,500,000 toll board calls in 1932".(142)

are supplying an increasing percentage of experienced operators for private branch exchange switchboards. However, there still remains a real opportunity to better the service by improvement of private branch exchange operation".

(144)

As pointed out in this paragraph, these switchboards are operated by the employees of the subscribers. For that reason, "it might be argued that poor service was

(141) Reference 35, pages 15-16

(142) Reference 42, page 8





## 6. PRIVATE BRANCH EXCHANGE SERVICE

Private branch exchange service or PBX, as it is popularly called, has become an increasingly important service in the Bell System since 1920. Whereas in that year there were 8,020,000 stations of all classes, in 1928 there were 2,740,000 stations served from private branch exchanges alone. The importance of this class of service was referred to in the annual report of the American Telephone and Telegraph Company and public recognition to "the opportunity for Private Branch Exchange betterment" (143) is given in the following paragraph:

"About one-fifth of all telephones receive service through private branch exchange switchboards which are operated by employees of the subscriber. In order to improve the service which they render, the Telephone Companies have opened schools for their instruction in which during 1928 thousands were trained. The companies also are supplying an increasing percentage of experienced operators for private branch exchange switchboards. However, there still remains a real opportunity to better the service by improvement of private branch exchange operation". (144)

As pointed out in this paragraph, these switchboards are operated by the employees of the subscribers. For that reason, "it might be argued that poor service ren-

(143) Reference 44, page 1

(144) Reference 45, page 4





dered by them was not" the telephone companies' "responsibility or fault". But as the "whole telephone service structure" has been devised by the telephone companies, they must assume responsibility "for the service arrangements which require the subscriber to operate his private board".

(143)

The importance of this feature of telephone service may be appreciated from the fact that "there are almost as many operating people at branch exchanges" as there are in the telephone operating rooms. (145)

The activities of this department consist in assisting in maintaining at the board's disposal of the right type and properly trained. Since 1897 there has been a yearly average of 11,000 attendants and operative attendants who were trained or retrained by this department. This department aids the subscribers in engaging their own attendants or in furnishing trained attendants where the subscribers request this assistance. During recent years approximately 75 per cent. of such requests for attendants were filled. Since the year 1894 there has been an increase of 300 per cent. in the number of requests for trained attendants, and in 1922 over 35,000 attendants were

(145) Reference 44, page 2





a. ORGANIZATION AND ACTIVITIES

In order that the private branch exchange switchboards might "receive the proper amount of supervision necessary to attain" (146) a quality of service which would compare favorably with the service which was offered by the central office operators, a private branch exchange department was organized with a personnel adequate as to size and qualifications. The personnel in this department, as a rule, is a part of the district organization rather than of the local central office. "Every effort is made to appoint to this department employees of the best type and personality -- women of broad experience, thoroughly trained in long distance as well as in local operating".(147)

The activities of this department consist in assisting "in maintaining at the boards a personnel of the right type and properly trained". Since 1927 there has been a yearly average of 11,000 attendants and prospective attendants who were trained or retrained by this department. This department aids the subscribers in engaging their own attendants or in furnishing trained attendants where the subscribers request this assistance. During recent years approximately 75 per cent. of such requests for attendants were filled. Since the year 1924 there has been an increase of 300 per cent. in the number of requests for trained attendants, and in 1929 over 36,000 attendants were

(146) Reference 35, page 4  
 (147) Reference 38, page 23

(147) Reference 38, page 23





placed. In many cases, the work of the switchboard attendants is only incidental to their other duties as typists or clerks and "several of the Associated Companies, through advertising and other means, are placing themselves in a position to supply more attendants who are qualified for such positions".(147)

The personnel of this department in their visits to the switchboards also explain to the attendants any new methods of operating which have proven satisfactory in the central offices. They also endeavor on these visits "to promote the better use of the telephone by the extension users and attendants and to inform the customer of the many services which the telephone company is ready to perform for the betterment of the private branch exchange service in general".(147)

As a fairly close approximation of actual conditions may be obtained. These data show that some improvement is being made. The provisional index, for example, of the overall service furnished by the private branch exchange switchboards in the twenty-six largest cities showed an increase from 72 in 1901 to 73 in 1902.

Continued attention is being given to the service results as improvements in PBX service affect not only private branch exchange subscribers, but every other customer who either calls or is called by a PBX station".(148)

(146) Reference 35, page 23

(148) Reference 36, page 7

(147) Reference 38, page 23





## b. SERVICE RESULTS

In its activities the private branch exchange department has as its prime purpose the increase in the quality of the service at these switchboards. Although it seemed doubtful that switchboards operated by the subscribers' employees "could be counted on to give as good service" as is given at the switchboards operated by the telephone company, it did not "seem entirely unreasonable to expect that appreciable improvement" (148) could be effected.

Special observing sets were devised which could be used on the visits to the switchboards in order to obtain an overall picture of private branch exchange results. The data of these observations are analyzed and although the results are not summarized as completely as the results of central office operations, a fairly close approximation of actual conditions may be obtained. These data show that some improvement is being made. The provisional index, for example, of the overall service furnished at the private branch exchange switchboards in the twenty-six largest cities showed an increase from 72 in 1931 to 78 in 1932.

Continued attention is being given to the service results as "improvements in PBX service affect not only private branch exchange customers, but every other customer who either calls or is called by a PBX station".(149)

(148) Reference 38, page 23

(149) Reference 35, page 7





## SECTION IV

## PLANT DEPARTMENT





## PLANT DEPARTMENT

"Telephone plant is a generic term for the physical property used in furnishing telephone service. It includes aerial wire and cable lines, buildings, equipment, and all other material things directly or indirectly used in providing service. The Plant Department is responsible for the construction and maintenance of this physical plant".(150)

General The work of the plant department can be grouped under the four general classifications of engineering, construction, installation and maintenance. In this section only the activities of the installation and maintenance groups will be reviewed as they are the functions of the plant department with which the subscribers have the most frequent contacts. There are also the features in which the improvements, which have been made toward giving a better quality of service, have been principally noticed by the subscribers in general.)

The Division Plant Superintendents represent the General Plant Manager in their respective divisions and have on their staff a Division Plant Supervisor, a Division Plant Engineer, a Division Supervisor of Buildings, Supplies and Motor Vehicles, and two or more Plant Superintendents.

The duties of the Division Plant Supervisor within his division are similar to those of the General Plant Supervisor. The Division Plant Engineer is an advisor to the Div-

(150) Reference 5, page 75

(152) Reference 6, page 97





## 1. ORGANIZATION

"The performance of the work" of the plant department "naturally requires an extensive plan of organization".

(151) In number of employees, it is the second largest department in every telephone company.

The highest in authority in the plant department is the General Plant Manager, who has reporting to him a General Plant Supervisor, a General Supervisor of Buildings and Supplies, a General Supervisor of Central Office Equipment and Installation and a number of Division Plant Superintendents. The functions of some of these supervisors is apparent from their titles. The General Plant Supervisor through the members of his staff directs the construction of outside plant and furnishes the field forces "with information regarding such new and improved methods and devices" for installation and "maintenance work as are from time to time developed".(152)

The Division Plant Superintendents represent the General Plant Manager in their respective divisions and have on their staff a Division Plant Supervisor, a Division Plant Engineer, a Division Supervisor of Buildings, Supplies and Motor Vehicles, and two or more Plant Superintendents.

The duties of the Division Plant Supervisor within his division are similar to those of the General Plant Supervisor. The Division Plant Engineer is an advisor to the Div-

(151) Reference 5, page 91

(152) Reference 5, page 97





Division Plant Superintendent on technical and engineering matters and "furnishes advice and assistance to the field forces in connection with any unusual or especially difficult problems that arise".(153)

The Plant Superintendents assist the Division Plant Superintendent and have charge of Toll and Transmission testing, central office inspections and changes from manual to dial operations. The District Plant Superintendents report directly to a Plant Superintendent instead of to the Division Plant Superintendent and have general supervision of the installation and maintenance work in a group of central offices.

An organization chart of the Plant Department in an operating area is shown on Figure 27, on page 141.





## PLANT DEPARTMENT

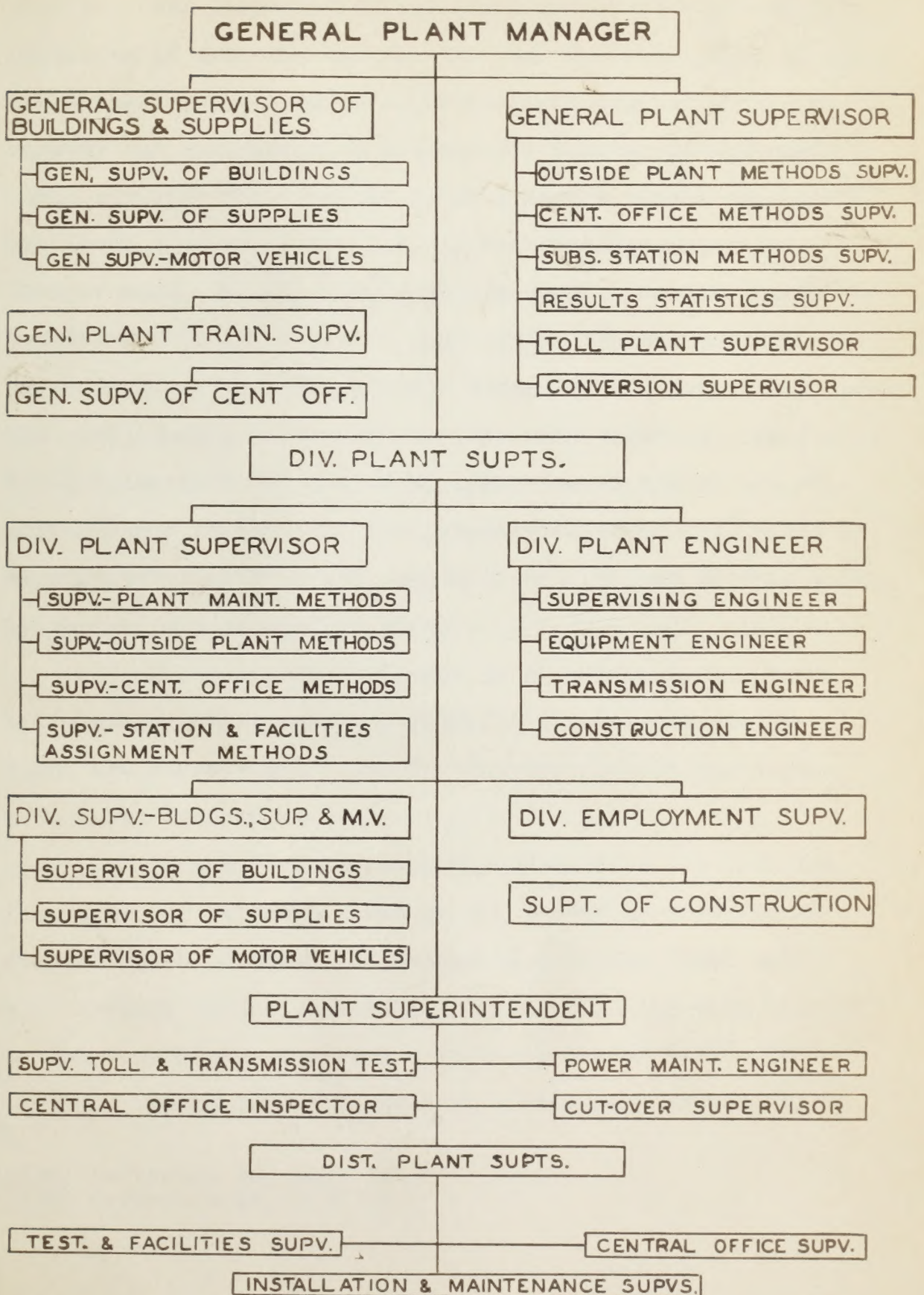


FIGURE 27





## 2. PERSONNEL AND TRAINING

The personnel of the plant department is largely comprised of men and, next to the traffic department, it is the largest department in each telephone company. "The diversity and complexity of present day equipments and circuits require that the men be of somewhat better than average intelligence, of a naturally technical and practical turn of mind, and of considerable manual dexterity. With the progressive introduction of dial system central offices, the trend is toward an even greater diversity and complexity and the requirements become necessarily more rigorous. This with the growing need for thoroughly experienced men of supervisory caliber to care for the progressive expansion, makes it imperative" that "the men, who will be assigned to this work, be chosen very carefully".(154)

The graduating classes of high schools and especially of technical schools, where their requirements are high, are recruiting fields for the type of men who have been found desirable.

At the General Plant Conferences of the Bell System, training is "emphasized as the factor of most consequence" on which attention should be focussed, "not only with respect to the vocational workers but also with respect to the supervisory forces and higher ranks as well".(155)

Up to 1928 the training of the men was carried on

(154) Reference 46, page 5

(155) Reference 47, page 29





by the supervisory forces (foremen), but in their training activities they had no detailed instruction as to how they could best carry on this training. In order to supply this feature, a "Vocational Instructors Training Course was gotten under way in 1928".(156) "This course was designed to fit men not only for teaching themselves, but to train others to teach".

(157) In order to further assist the supervisory forces in their work of training the men under their supervision "teaching texts and detailed lesson plans were developed for the various vocations".(157) These courses were developed with the aid of groups of experienced men from the field forces of several of the telephone companies. The lessons in these courses are divided into four steps as follows:

"Step 1. Preparation, in which the learner's mind is focussed on an idea already grasped which is nearest to the new one to be taught.

Step 2. Presentation, in which the new ideas are presented to the learner in such manner that they are easily and readily absorbed.

(160) Step 3. Application, in which the learner applies

the new idea under supervision of the teacher who makes clear any points the learner failed to grasp in the presentation. This is a checking step.

Step 4. Test, in which the learner does the job a-

(156) Reference 47, page 30

(157) Reference 48, page 5





work, the man alone with the required speed and accuracy  
 and satisfies the teacher that he has assim-  
 ilated the ideas and can apply them effec-  
 tively".(158)

There are two methods of giving these courses. In  
 the districts which are large enough the new employees are  
 given the courses in plant schools. In the smaller dis-  
 tricts the training is given on the job by the supervising  
 foremen. Under each plan the learners practice each new  
 assignment "under supervision until the practice becomes a  
 permanent fixed habit" and "it is second nature for them to  
 do the work in the proper way".(159)

In general of these two methods of training, it  
 is felt "that workmen training on the job under actual con-  
 ditions is the most effective method for the development  
 of skilled workers". However, whether the training is done  
 in schools or on the job "the underlying fundamental of the  
 plant training program is that it shall be continuous in  
 greater or lesser degree throughout the workingman's career".  
 (160)

The training given to the workmen is supplemented  
 by the different measurement plans which are in use in the  
 different companies. As the men are employed over wide  
 areas, "the immediate supervision is occasional and is of-  
 ten remote and under conditions involving such diversity of

(158) Reference 47, page 30

(159) Reference 49, page 2

(160) Reference 50, page 38





work, the management cannot determine adequately, by observation and contact alone, the quantity and quality of production". With the measurement plans comparisons can be made between groups and "analysis of such comparative data by the line and staff supervision discloses avenues for the training and development of field supervision and the introduction of improved methods and equipment. This in turn leads to job training of the workers with a view to their improvement in mental and manual proficiency".(161) The measurement plans with which the subscribers are most concerned in the service which they receive are those on Installation, and Maintenance and Repairs. Inspection of a representative sample of completed jobs" was inaugurated in the latter part of 1923. This plan is so designed that stress is placed on recurring defects and on defects having an immediate or potential reaction on service. It also "makes provision for obtaining an indication as to whether the installer's contact was satisfactory and the work performed in a manner pleasing to the customer".(162) In addition, the plan gives the supervisor an opportunity to determine the points on which the installer should be retrained.

Two of the measurement plans which are large factors in the overall quality of the installation work from the subscriber's viewpoint are the promptness of installation and the Appointment Plan.

(162) Reference 52, page 1

(161) Reference 51, pages 1-2





## 2. INSTALLATION

"So many plant and sales activities center around installation and service order work in general that these subjects naturally receive attention" at all plant operation conferences. "Since at least a third of all plant employees are directly concerned in these activities in one way or another in their daily work, no better indication is needed of the opportunities that service order methods and practices hold for the rendering of good service to customers".(162)

In connection with the work of installing telephone instruments, "a plan to appraise the quality of station installation work by inspection of a representative sample of completed jobs" was inaugurated in the latter part of 1929. This plan is so designed that stress is placed on recurring defects and on defects having an immediate or potential reaction on service. It also "makes provision for obtaining an indication as to whether the installer's contact was satisfactory and the work performed in a manner pleasing to the customer".(163) In addition, the plan gives the supervisor an opportunity to determine the points on which the installer should be retrained.

Two of the measurement plans which are large factors in the overall quality of the installation work from the subscriber's viewpoint are the promptness of Installation and the Appointment Plan.

(162) Reference 52, page 1

(163) Reference 50, page 13

(164) Reference 50, page 14





# a. PROMPTNESS OF INSTALLATION

Analysis of the service orders completed in 1925 showed that one-third of the orders "were delayed beyond the date requested by the subscriber or beyond stated time periods". At that time the service orders were usually completely on a seven day basis and the views of the operating areas seemed to be that this time interval was "shorter than the subscriber had a right to expect".(163)

"Early in 1926 the necessity for establishing installation service on a basis of closer adjustment to the requirements of the customer was recognized".(164) Installation work was then generally handled with group crews who operated over a large area. These crews were accordingly split up into two-men teams who operated in a smaller area. "One-man installation cars were also given a trial".(165) At the same time a study which was made of the service order routine showed that a great portion of the installation time was consumed in the processes prior to the time that the orders were given to the installers. Efforts were made to shorten this time so that all orders might be completed within the time objectives.

The trials which were made with one-man installation cars showed that there had been an improvement effected in the promptness of service order completions and that installation costs had been lowered. The plan was further

- (163) Reference 52, page 1
- (164) Reference 53, page 9
- (165) Reference 53, page 10





extended in 1927 and, although this resulted in an increase in the motor vehicle expenses, it was found that this increase was offset by the time saved in completing each order and by the increased revenues derived from more prompt installations of service.

Changes had also taken place during this period in the character of the outside plant so that less time and work were required for stringing wires to the subscribers' locations.

The improvements made in 1925 and in 1926 led to a reduction in 1927 in the time interval from seven days to five days. This same year some of the companies tried the plan of completing service orders on a three day basis. The plan gradually spread to the other companies and an analysis of the service order work for the year 1928 showed that "for all orders not delayed for lack of facilities, or awaiting due dates beyond the stated periods, the average elapsed time was 3.2 days".(166) This compared with an average time interval of 4.7 business days in 1925.

In effecting the decrease in the elapsed time before installation, the delays caused by the routine and clerical work continued to be an important factor. In the larger cities the frequency of deliveries of the orders to the plant department was increased and in some of the larger metropolitan areas, orders were delivered hourly to the

(166) Reference 47, page 8

(167) Reference 53, page 6





However, that a too liberal attitude in this respect might plant department. Where these two departments, however, were housed in separate buildings, considerable time was lost even under the hourly plan of delivery. These delays led one company in 1928 to the "consideration and introduction of the printer telegraph on an experimental basis as an aid to order transmittal".(167) These experiments proved so successful in reducing the elapsed time in completing orders, that the plan was extended to all the large cities in the Bell System and today, as is shown on Figure 11, on page 57, over 95 per cent. of the orders are transmitted by the commercial department to the plant department on the day on which they are received.

In conjunction with the efforts which were made to reduce the elapsed time of completing service orders, studies were also made of the means of reducing installation costs. The adoption of the two men crews and one-man car installers had resulted in a reduction in the number of man-hours required for each installation. But this decrease had been slight and was mostly offset by an increase in the motor vehicle costs. From a study of the orders calling for the installation of new service for a subscriber, it was found that in a large number of cases, the service was installed at a location where service had previously been removed. It was felt that some plan of leaving the telephone instrument on the premises when a subscriber moved might present an opportunity of reducing some of the installation expense. It was realized,

(163) Reference 53, page 13

(167) Reference 53, page 6

plant department. Where these two departments, however, were housed in separate buildings, considerable time was lost even under the hourly plan of delivery. These delays led one company in 1928 to the "consideration and introduction of the printer telegraph on an experimental basis as an aid to order transmission". (167) These experiments proved so successful in reducing the elapsed time in completing orders, that the plan was extended to all the large cities in the Bell System and today, as is shown on Figure 11, on page 57, over 85 per cent of the orders are transmitted by the commercial department to the plant department on the day on which they are received. In conjunction with the efforts which were made to reduce the elapsed time of completing service orders, studies were also made of the means of reducing installation costs. The adoption of the two man crews and one-man car installers had resulted in a reduction in the number of man-hours required for each installation. But this decrease had been slight and was mostly offset by an increase in the motor vehicle costs. From a study of the orders calling for the installation of new service for a subscriber, it was found that in a large number of cases, the service was installed at a location where service had previously been removed. It was felt that some plan of leaving the telephone instrument on the premises when a subscriber moved might present an opportunity of reducing some of the installation expenses. It was realized,



however, that a too liberal attitude in this respect might have some serious disadvantages. For example, in a locality where 90 per cent. of the homes had telephone service, the chances were nine to one that a new tenant would want service installed. On the other hand where only ten or twenty per cent. of the residents in the neighborhood were subscribers to telephone service the opportunities for furnishing service to a new tenant were not as great. An important factor, therefore, in developing this plan was an accurate means of determining what happened to those stations which were left in. "With such information available, the left-in station plan could be controlled to the greatest economic advantage".(168)

Against the savings in installation costs, there was the offsetting investment charges on idle equipment. Data was therefore collected on a number of left-in stations, showing the length of time each station was idle. By means of these data, it was possible to determine for each area the most economical left-in period.

These several improvements brought about not only a reduction in the elapsed time but they also made it possible for the supervisory forces to program the work more accurately. The principal advantage, however, was the change of attitude regarding the subscribers' wishes. Where it had been felt in 1925 that the subscriber should not expect to have service installed in less than five days,

(168) Reference 53, page 13

(169) Reference 53, page 22





efforts were being made in 1929 "to provide the subscriber with service at the time he wanted it".(169)

Installation of telephone service was the logical conclusion of the efforts which had been made to speed up service order work and was predicated on the assumption that the Bell System statement of policy of providing the best possible service would not ring true unless the subscriber obtained the type of service desired at the time he wants it and at the designated place".(170) Criticisms which had been received in connection with completion work showed that, although the service had been installed in three, five or seven business days, many subscribers were not satisfied with the quality of the installation work. It was also noticed that a large number of orders were rushed through on the final day of the stated period or were delayed because the subscriber was not at home when the installer called. Analysis of the criticisms showed further that while some subscribers felt that a three day installation period was too long, others did not want service in three days or even in five days.

When the appointment plan was first tried in cooperation with the commercial department, the subscriber was usually asked when he wanted the service. A large percentage would mention the following day or even the same day. The result was that the plant department on some days was overloaded with orders while on other days there was very

(169) Reference 53, page 22

(170) Reference 54, page 1





b. APPOINTMENT PLAN.

The adoption of the Appointment Plan for the installation of telephone service was the logical conclusion of the efforts which had been made to speed up service order work and was predicated on the assumption that the Bell System statement of policy of providing the best possible service would not ring true unless the subscriber obtained "the type of service desired at the time he wants it and at the designated place".(170) Criticisms which had been received in connection with completion work showed that, although the service had been installed in three, five or seven business days, many subscribers were not satisfied with the quality of the installation work. It was also noticed that a large number of orders were rushed through on the final day of the stated period or were delayed because the subscriber was not at home when the installer called. Analysis of the criticisms showed further that while some subscribers felt that a three day installation period was too long, others did not want service in three days or even in five days.

When the appointment plan was first tried in cooperation with the commercial department, the subscriber was usually asked when he wanted the service. A large percentage would mention the following day or even the same day. The result was that the plant department on some days was overloaded with orders while on other days there was very little to suggest the following day to the subscribers.

(170) Reference 54, page 1 appointment plan, at first, re-





little to do. Installation costs began to show a tendency to increase and it seemed as if the benefits derived from the improvements of the previous years would be nullified.

After a brief trial period, the plant and commercial departments agreed to modify the original plan slightly. Instead of inquiring from the subscriber when he wanted service, the commercial representatives were to inquire if installation on a date two or three days later would be satisfactory. When the suggested date was satisfactory to the subscriber, service was promised for that day. If the subscriber did not want service until a later date, the installation was scheduled for the day requested. At first a three day period was agreed upon as the elapsed time which would be suggested to the subscriber. The plant schedules were so set up, however, as to allow a working margin for those subscribers who wanted service within the three day period. The plant department was always consulted on such orders, and if the working margin had not been used up by previous requests, an appointment date was fixed with the subscriber for the day on which he wanted service installed.

In order to derive the maximum benefits from this plan, the plant department kept the commercial department informed of the load for each day so that when the number of installations promised for a certain day had reached the work load for that day, the commercial department would begin to suggest the following day to the subscribers.

The adoption of the appointment plan, at first, re-





sulted in slight increases in the commercial costs, but these were gradually offset by decreases in plant costs which resulted from a more even distribution of the work. As the use of the plan became more general, it was found possible to reduce the initial elapsed time of installation suggested to the subscriber to two working days.

In cases where the installation is delayed due to lack of facilities or unusual construction the subscriber is informed of the nature of the delay and arrangements are made for a new service date.

By the adoption of the plan it has been possible to decrease the elapsed time on all service orders to two business days. During the year 1932 over 94 per cent. of all orders were completed under the appointment plan and in over 97 per cent. of the cases the service was installed on the appointed day. The very marked decrease in the number of criticisms on the quality of the installation work, however, was the most encouraging benefit which resulted from the adoption of this plan.

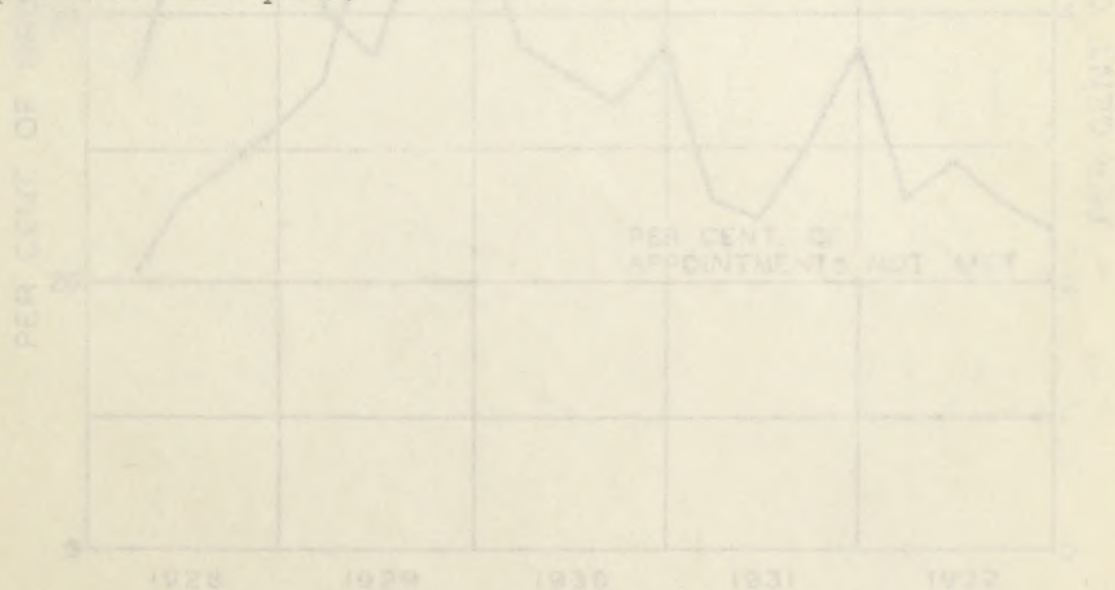


FIGURE 28





# ORDER COMPLETION WORK

BELL OPERATING COMPANIES

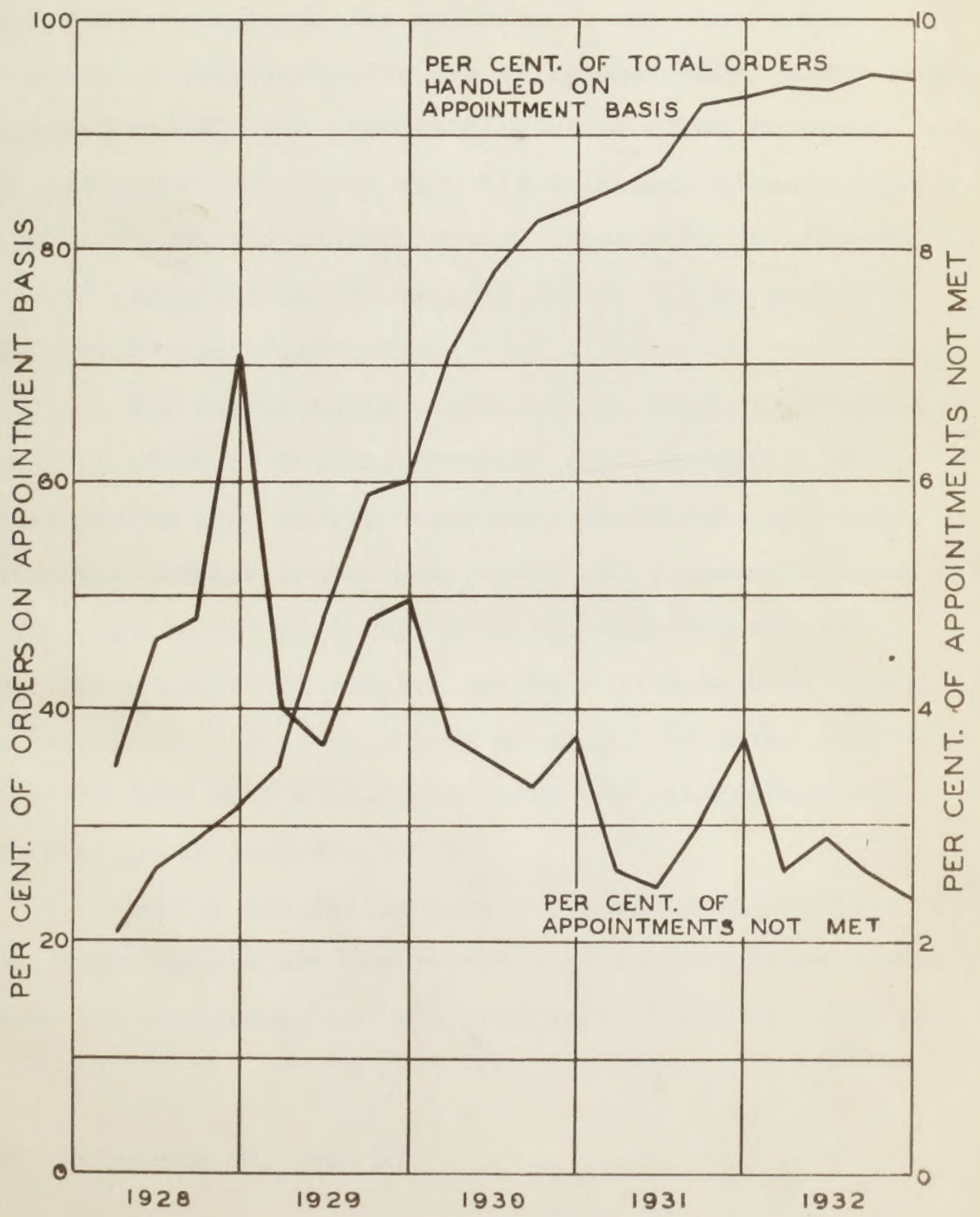
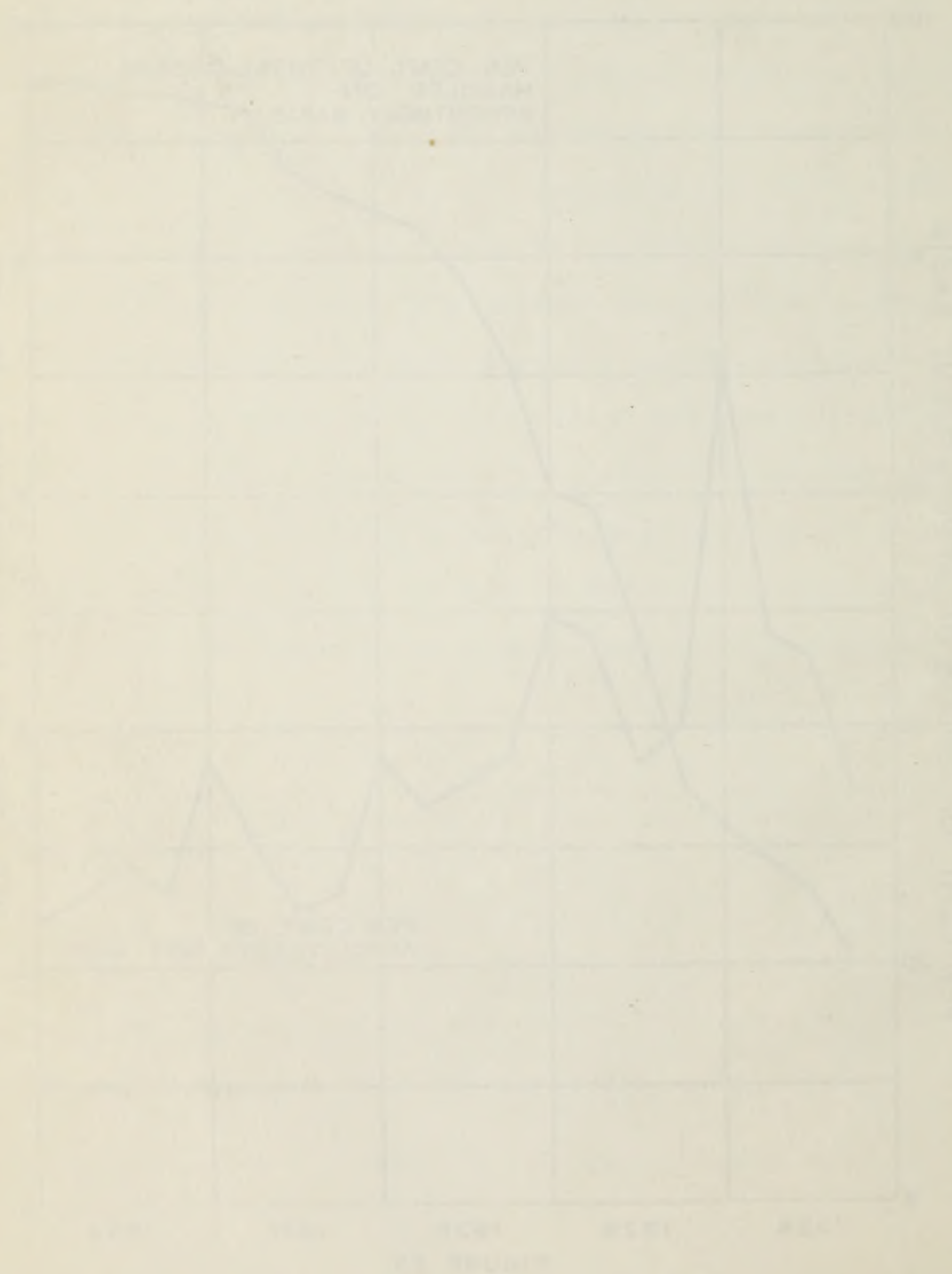


FIGURE 28

# ORDER COMPLETION WORK

PERCENT OPERATING CAPACITY





#### 4. MAINTENANCE AND REPAIRS

After the telephone service has been installed according to the subscriber's wishes in respect to time, manner and place, it is necessary that the service be maintained in satisfactory condition and that repairs, when needed, be made promptly. "Probably no other group of plant employees can contribute more to the building up and maintaining of satisfactory relations with the telephone using public than those responsible for the handling of reported troubles. The subscriber, at a time when his telephone is out of order or perhaps entirely out of service, naturally expects considerate attention on the part of the telephone employees with whom he deals".(171)

The subscriber's first contact when his telephone is out of order is usually a repair service clerk. It is necessary for good public relations, therefore, that the subscriber receive prompt and courteous attention from these clerks. As an aid in determining the kind of attention which the subscribers receive and as a yardstick to measure the improvements which are made or should be made, observations are made of the contacts which the subscribers have with the repair service clerks.

Two of the features on which analyses are made from these observations are the promptness with which the clerks answer the telephone, and the promptness with which the re-

(172) Reference 56, page 7

(171) Reference 55, page 1





ported troubles are cleared. When the average time for clearing troubles was four hours, the "service criticisms of delay in clearing trouble were 14 per cent. of the customers' reports observed. When the elapsed time was reduced to 1.8 hours, these criticisms were reduced to 7 per cent".(172)

Although the speed of answer is an important factor from the subscriber's viewpoint, a reduction in the time of the answer does not materially affect the overall time of clearing the trouble. An improvement in the speed of answer, however, has served to remove some of the irritation of the subscribers and has also been a concurrent factor in reducing the number of criticisms.

Other improvements have also been effected in the tone of voice, phraseology and attention of the repair service clerks by a better selection of the personnel and by giving clerks more intensive training along the lines of the training given the operators in the traffic department.

so thoroughly systematized and carried out on such a uniform and scheduled basis as in the central offices.

"Maintenance or repair work can be divided into two channels, corrective and preventive"(173) corrective maintenance is the term commonly applied to the work which is done to clear up troubles which have been reported by the subscribers. Preventive maintenance applies to the work which is made to find and remedy trouble making conditions

(172) Reference 56, page 7

(173) Reference 46, page 7





#### a. CENTRAL OFFICE PLANT

The maintenance of the central office plant in a satisfactory condition so as to avoid any lapse of service, has an important bearing on the subscriber's viewpoint of the service for which he has subscribed. As the equipment in the central offices and particularly in dial central offices is the most intricate of all the equipment used in connection with the establishment of communication between different subscribers, it would seem that the greatest percentage of the subscribers' reports of trouble would be due to conditions of the equipment in the central offices. Over a period of years, however, the percentages of troubles due to central office faults have been much smaller than those due to other items of plant. This condition has been due principally to the fact that central office men are more highly trained than the other plant men and because in no other part of the plant has preventive maintenance work been so thoroughly systematized and carried out on such a uniform and scheduled basis as in the central offices.

"Maintenance or repair work can be divided into two channels, corrective and preventive".(173) Corrective maintenance is the term commonly applied to the work which is done to clear up troubles which have been reported by the subscribers. Preventive maintenance applies to the endeavors which are made to find and remedy trouble making conditions





before service interruptions occur. There is usually a close correlation between the two and it has been the general experience that an increase in preventive maintenance work has resulted in a decrease in the need for corrective maintenance. There is a reasonable limit, however, to which preventive maintenance practices can be carried. These limits are the average costs of maintenance per station. As long as the overall maintenance and repair expenses per station are not increased by increased maintenance efforts, the avowed policy of the Bell System, of furnishing service free from defects and at reasonable costs, has been maintained.

The amount of effort which can properly be devoted to preventive maintenance can be determined by the number of troubles of the same nature which are reported by subscribers. With this aim in view the monthly results data of trouble reports are carefully scrutinized to determine, from the performance of the different types of equipment, on which types systematic inspections should be made.

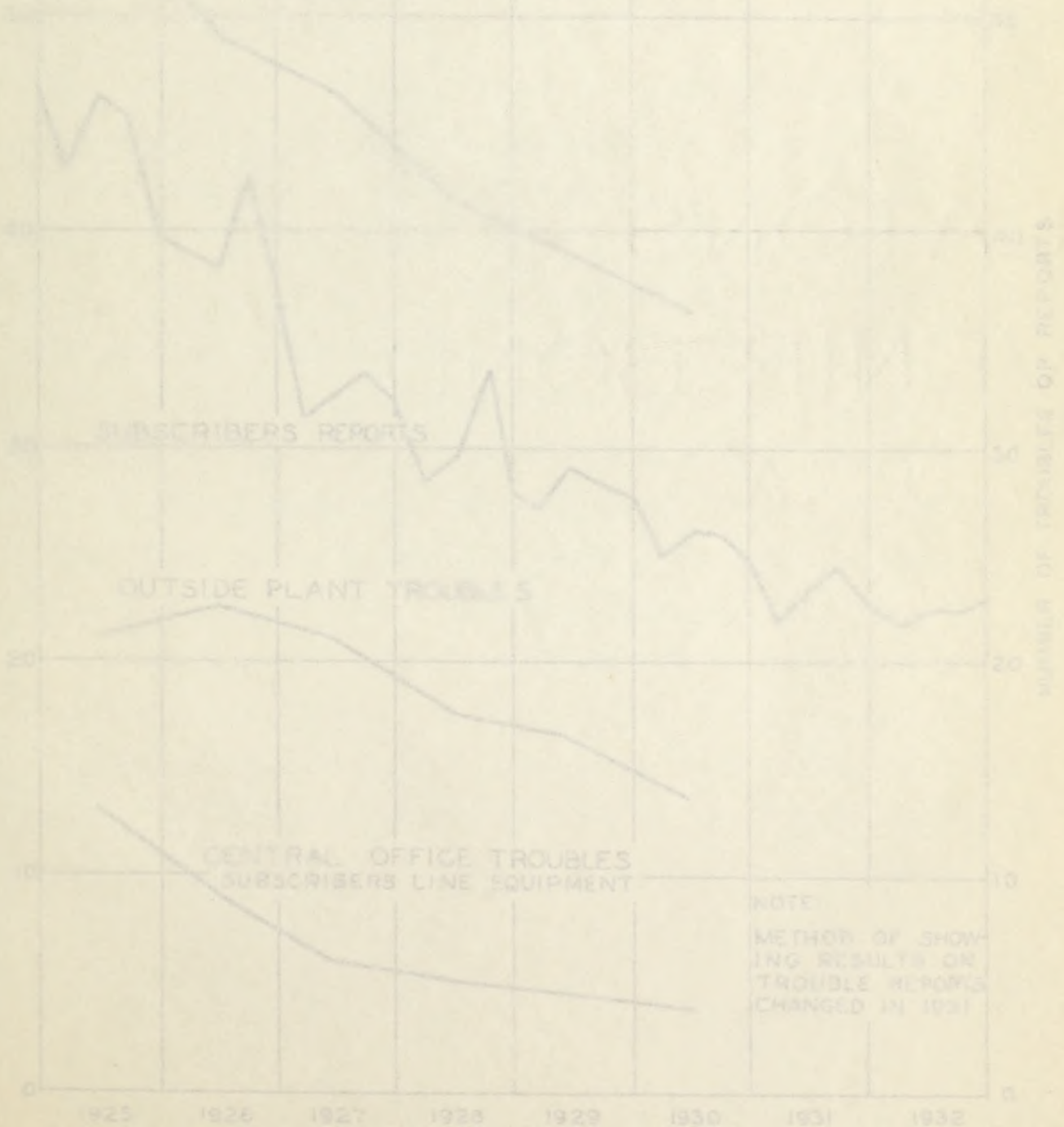
Another source of information which is used in correcting trouble in advance of a report is the 'Don't Answer' data which are compiled by the traffic department. Tests are made periodically on lines on which calls were not completed due to a don't answer condition to discover the lines on which there was no answer due to plant conditions. As is shown on Figure 16, on page 98, the percentage of don't answer calls due to plant faults is low, but the total number of calls affected is large and warrants the efforts made to improve the situation.





## AND SUBSCRIBERS REPORTS

The other factors which have served to reduce the number of trouble reports due to central office conditions have been better central office installation work, and improvements in the design and manufacture of the equipment. As may be seen from Figure 29, on page 162, the efforts made along the lines of preventive maintenance have resulted in a marked decrease in trouble reports received which were due to defects in the central office equipment.







# COMPARISON OF TROUBLES AND SUBSCRIBERS REPORTS PER 100 STATIONS

BELL SYSTEM-ASSOCIATED OPERATING COMPANIES

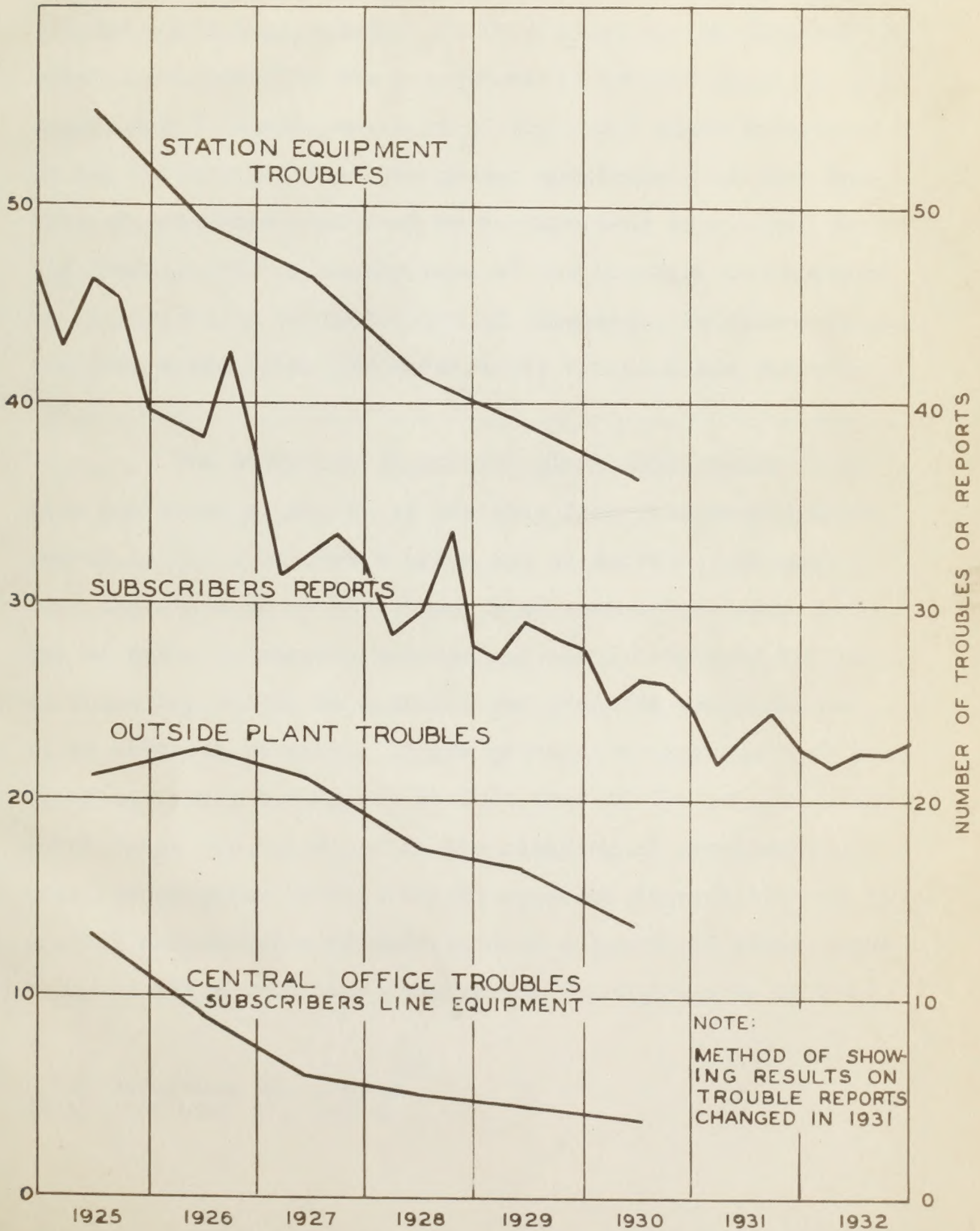
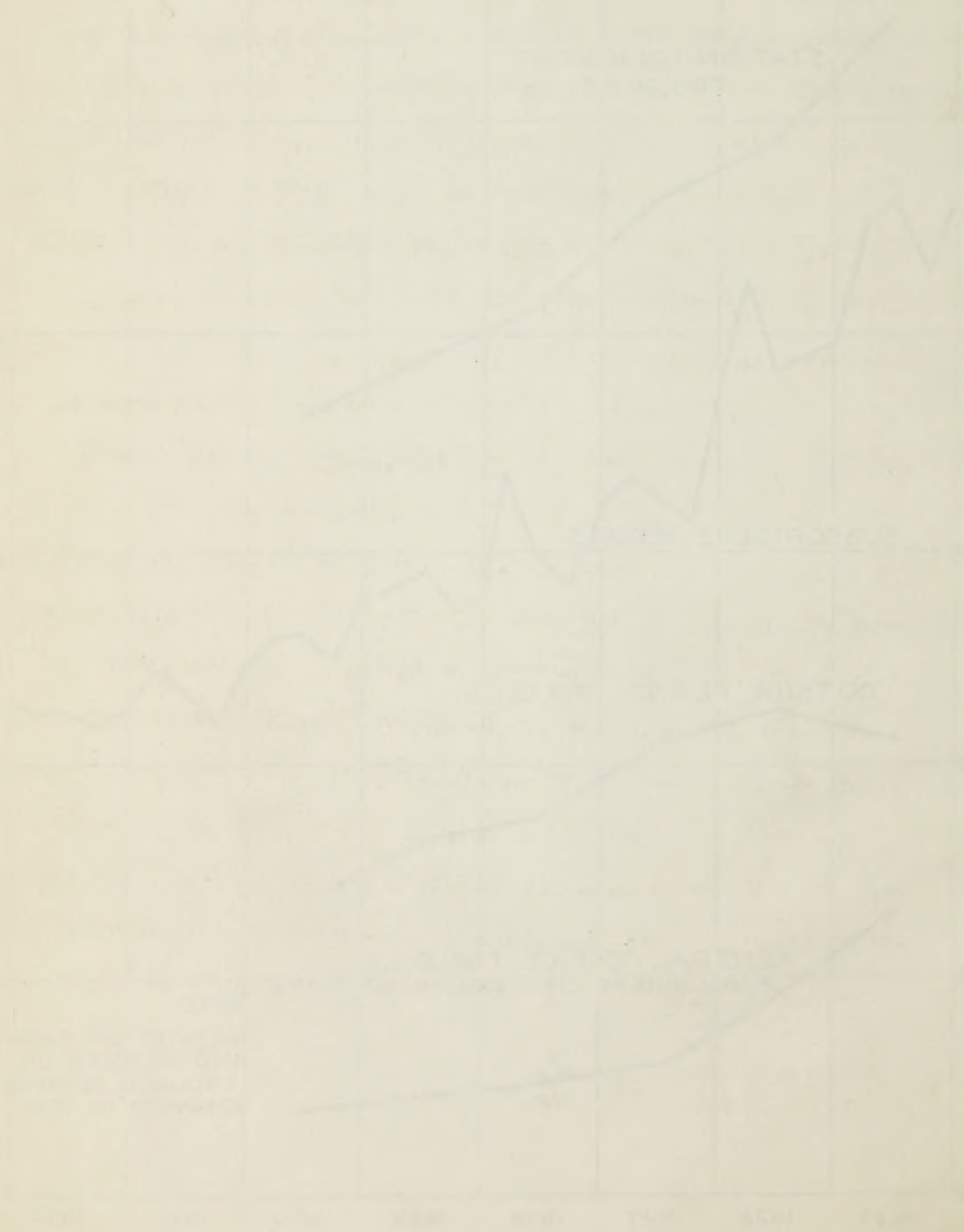


FIGURE 29

COMPARISON OF THE  
AND SUBCUTANEOUS  
PERIOD STATISTICS

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CHIEF, BUREAU OF HYGIENE,  
U.S. DEPARTMENT OF HEALTH

STATISTICAL  
BUREAU





## b. EXCHANGE OUTSIDE PLANT

Of the "several plant fundamentals which are controlling factors in giving efficient and prompt installation" and continuous service, the first is "the condition of the outside plant particularly in its respect to its physical condition".(174) As the investment in outside plant is equivalent to about one-third of the total plant investment, it may be realized that the proper maintenance of this feature of telephone equipment is an important task. Due to its location "in or on highways of the country, and because it is subject to various kinds of extraneous interference the problems surrounding its maintenance are many and varied". (175)

The objective in outside plant maintenance is to keep the plant as nearly as possible free from breaks which result in the subscribers being out of service. To meet this objective plans have been tried such as pressure testing of cables, improved methods for the location of faults, safeguarding cables in manholes and avoiding exposures to fires wherever possible. These preventive measures have been found necessary because it is felt that if the outside plant maintenance was "confined to the clearing of reported troubles, progressive deterioration" appeared "inevitable and the gradual accumulation of defects over a period of time" might "very easily result in a condition requiring a more or less

(174) Reference 53, page 4

(175) Reference 57, page 1





wholesale replacement of plant".(176)

As is shown on Figure 29, the number of troubles due to outside plant is considerably greater than the number due to central office equipment. The proportion of troubles due to outside plant would not be so serious were it not for the fact that "cable trouble generally takes longer to clear than other troubles, even under normal conditions".(177)

The analyses of the data collected in connection with trouble reports showed that the greatest number of troubles was due to sheath breaks in the cables. A further analysis of the causes for sheath breaks showed that approximately 60 per cent. were due to the cables being cracked or chafed, while less than 5 per cent. were due to telephone workmen. The result of these analyses clearly pointed to the need for improvement in the installation of the cables and in the inspection of the work once it had been completed. The nature of the faults, however, presented a serious difficulty. The cracks and breaks in the sheaths in a large number of cases were minute and could not be detected even by experienced workmen. The first step taken to remove these undesirable conditions was to revise the construction methods and practices so as to improve the quality of the construction work. A second step involved the introduction of pressure testing to new cables, and experimental work was carried on

(176) Reference 57, page 3

(177) Reference 58, page 4





in some companies in pressure testing of old cables. Pressure testing "consists essentially of tapping the sleeve of a joint in the cable, attaching a tank of compressed gas, admitting sufficient gas in the cable to create a pressure upwards of fifteen pounds and then applying liquid soap to the joints and seams. If the cable is not air-tight bubbles will appear at points where there are air holes through the lead sheath".(178)

Terminal troubles were the causes of the next largest number of cable troubles. A practical remedy for this source of trouble was effected by improvements in the design and manufacture of the terminal boxes so as to eliminate leakage.

The third largest factor contributing to cable faults was of an electrical nature and consisted of burns through the sheath or resulted from electrolysis. In many areas and particularly along the highways, it is necessary, due to municipal ordinances or for economical reasons to have both telephone and power lines on the same pole structures. Electric light fixtures also are often attached to telephone poles. Where such conditions occur, the telephone companies agree to maintain safe clearance between the two wire systems and when the lines of the respective companies are first installed, inspections are made to see that proper spacing has been allowed. Very often, however, when





subsequent additions are made to the original plant by either company, the workmen do not allow a safe clearance and a hazardous condition is created. Periodic inspections have been found to be the only solution for this source of trouble and when irregularities are discovered, it has generally been found that the power companies were ready to cooperate with the telephone companies in eliminating them.

(179) Other troubles such as defective soldering or wire work have been mainly remedied by giving the workmen concerned more intensive training and in revising the methods and practices of construction and maintenance work. As shown on Figure 29, the effort which has been directed toward improving this factor of plant maintenance has had very good results as is evident in the trend of outside plant troubles.

the subscribers' premises. The difficulty of the problem, however, only served to intensify the need for a careful study of the causes of station plant troubles.

Analyses of the station troubles have shown that a large number was due to such items as broken contactpieces, broken receiver caps, frayed or broken cords. In the case of these troubles it is evident that an extensive routine of periodic inspections would be necessary and that the decrease in troubles would not be commensurate with the expense involved. In most cases, also such troubles do not affect the quality of the service. From the standpoint of general





## c. STATION PLANT

Although the telephone companies are considered as having a monopoly and as being conducted without competition, they are nevertheless, faced with the keenest competition in respect to repair service by the electric light companies, gas companies and "servicing companies such as radio, electric refrigerator and other household appliance concerns".

(179)

In connection with the troubles which are due to central office or outside plant equipment, improvement has been possible by devoting greater time and effort to preventive maintenance, but in the case of station plant, it has not been practicable to develop plans for the systematic and periodic inspection of the equipment due to its location on the subscribers' premises. The difficulty of the problem, however, only served to intensify the need for a careful study of the causes of station plant troubles.

Analyses of the station troubles have shown that a large number was due to such items as broken mouthpieces, broken receiver caps, frayed or broken cords. In the case of these troubles it is evident that an extensive routine of periodic inspections would be necessary and that the decrease in troubles would not be commensurate with the expense involved. In most cases, also such troubles do not affect the quality of the service. From the standpoint of general

(179) Reference 156, page 3





appearance of the plant, however, it was not considered proper to avoid seeking a remedy. The maintenance practices were, therefore, revised and maintenance men were instructed to make complete tests and inspections of all the equipment on any visit to clear reported trouble. Under this plan, of course, the "frequency of inspections is dependent upon troubles developing in the equipment and the subscriber reporting the trouble".(180)

There are several sources of trouble, however, which may arise and which may continue to exist without the subscriber being aware of or reporting them. To reduce this quantity of unrecognized trouble, improvements were made in the design and manufacture of the equipment and a periodic routine of inspecting all those stations, where there is the greatest presumption of the existence of trouble, was instituted. It was found, for example, that business stations, as a rule, have a greater number of troubles than residence stations, and that those business stations, which were the most used, accounted for a larger percentage proportionally than those which had a low monthly usage. Depending on the location of the station, therefore, and on the usage made of it, programs have been set up in the different companies to inspect a certain percentage of all stations each year so that over a given period of time all the stations will have received a thorough inspection.





A third preventive maintenance plan involved the inspection of a percentage of all the installations after the installation work was completed. On these inspections all troubles are corrected and a tabulation is made of the troubles which are found. These tabulations when summarized are used as bases for the type of retraining which is given to the installers.

Although station troubles continue to account for the majority of the total subscribers troubles reported, the plans undertaken in the way of preventive maintenance have, as shown on Figure 29, on page 162, resulted in decreasing the number of troubles per one hundred stations.

A committee of General Managers for the purpose of recommending specific suggestions for adoption throughout the Bell System. This committee reported that, although there was "nothing about the business" which made "it a particularly hazardous one for the employee," accidents were "largely due to failure to observe certain easily understood safety manuals".(181) This committee recommended that the supervisory forces be interested with their responsibility of making the work safe for the employee and in instructing the employees in accident prevention and safety measures.

In order to stress upon the supervisory forces the need of accident prevention they were called upon to hold monthly conferences to discuss the work conditions of the employees.

(181) Reference 20, page 37

(182) Reference 23, page 4





## 5. PLANT ACCIDENTS

Included in the training program which is carried on among the plant department employees is a section devoted to accident prevention, for the reason that the telephone company officials feel "that doing a job safely is a pre-requisite to doing it at all".(181)

Accident prevention work was started as a specific activity of the Bell System about ten years ago. During the first few years the number of accidents was greatly reduced by providing better supervision and better tools and by improving the conditions of the plant. During 1928 the matter of accident prevention was thoroughly studied by a committee of General Managers for the purpose of recommending specific suggestions for adoption throughout the Bell System. This committee reported that, although there was "nothing about the business" which made "it a particularly hazardous one for the employee," accidents were "largely due to failure to observe certain easily understood fundamentals".(182) This committee recommended that the supervisory forces be impressed with their responsibility in making the work safe for the employees and in instructing the employees in accident prevention and safety measures.

In order to stress upon the supervisory forces the need of accident prevention they were called together in round table conferences to discuss the recommendations of the com-

(181) Reference 50, page 37

(182) Reference 59, page 4





mittee. At these round table discussions, an attempt was made to arouse the interest and enthusiasm of the supervisors and to have them feel that accident prevention should be put on a parity with technical perfection and economy of operation.

The instruction of the employees was mainly carried on by discussion of a particular job by the foremen with the particular individuals who were to perform the work. In the case of employees who work on poles, special lectures were given, illustrated by lantern slides, to show safe and unsafe methods of work and the necessity of using more than usual care when working on poles carrying power lines. Whenever it was possible these lantern slides pictured standard and non-standard plant conditions and they were instructed to report all non-standard conditions observed. These employees were also instructed in the methods to follow when it was necessary to work under non-standard conditions or to remove non-standard conditions.

Since 1924 the reports of all accidents fatal and serious have been analyzed to determine the contributory causes of the accidents. These reports are also further analyzed to ascertain the number happening to employees with different years of service. From these latter analyses it was found that a very large number happened to employees with less than one year's experience, with the result that, as a rule, the work of these employees is more closely supervised than that of the older employees. Where it is found that employees repeatedly have accidents, steps are taken to trans-





fer them to other work.

Since 1928, when greater emphasis was placed on accident prevention, the number of accidents per 1000 male plant employees, as shown on Figure 30, on page 173, has been reduced materially.

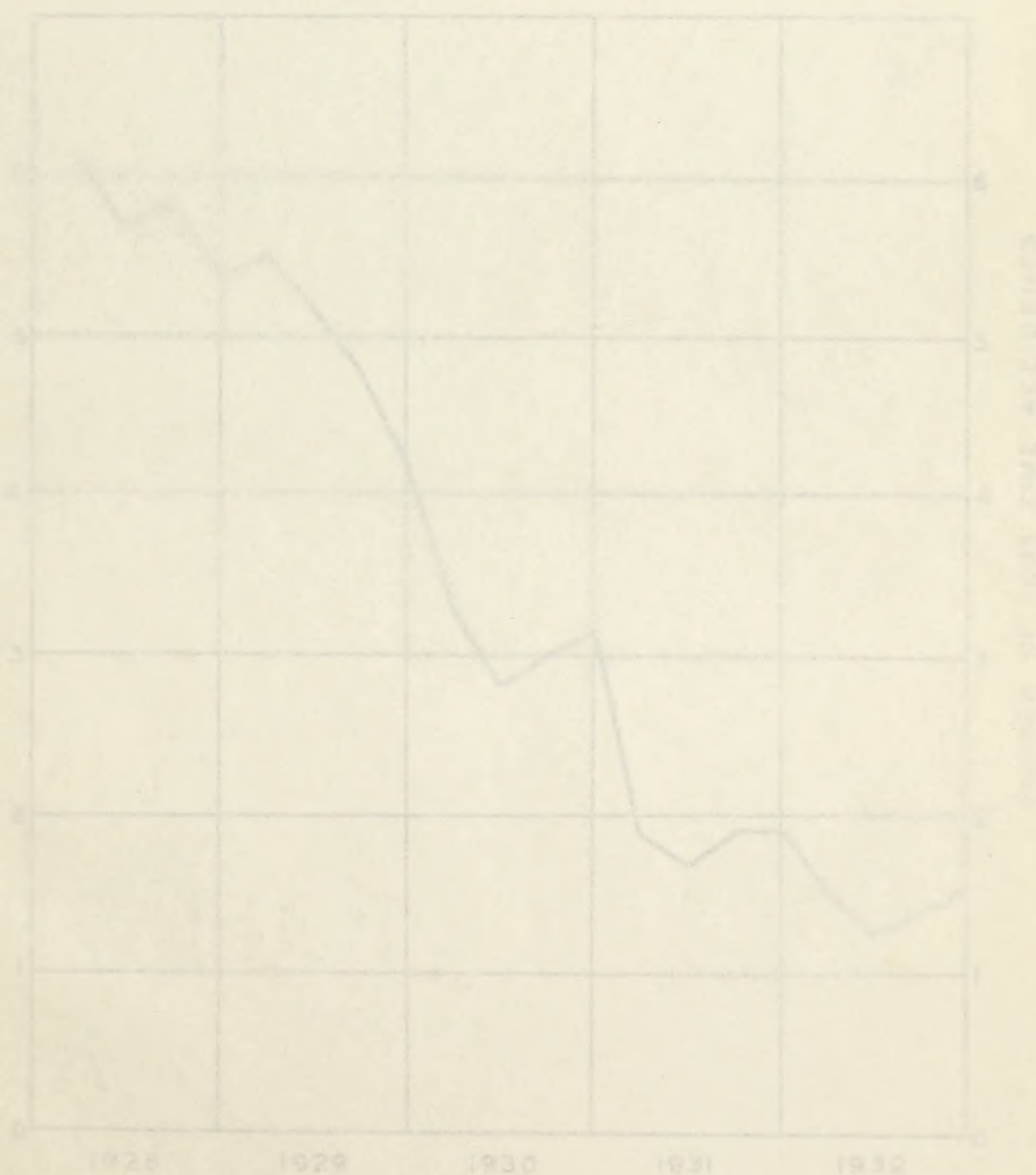


FIGURE 30





# ACCIDENT FREQUENCY RATES PER 1000 MALE PLANT EMPLOYEES

BELL OPERATING COMPANIES

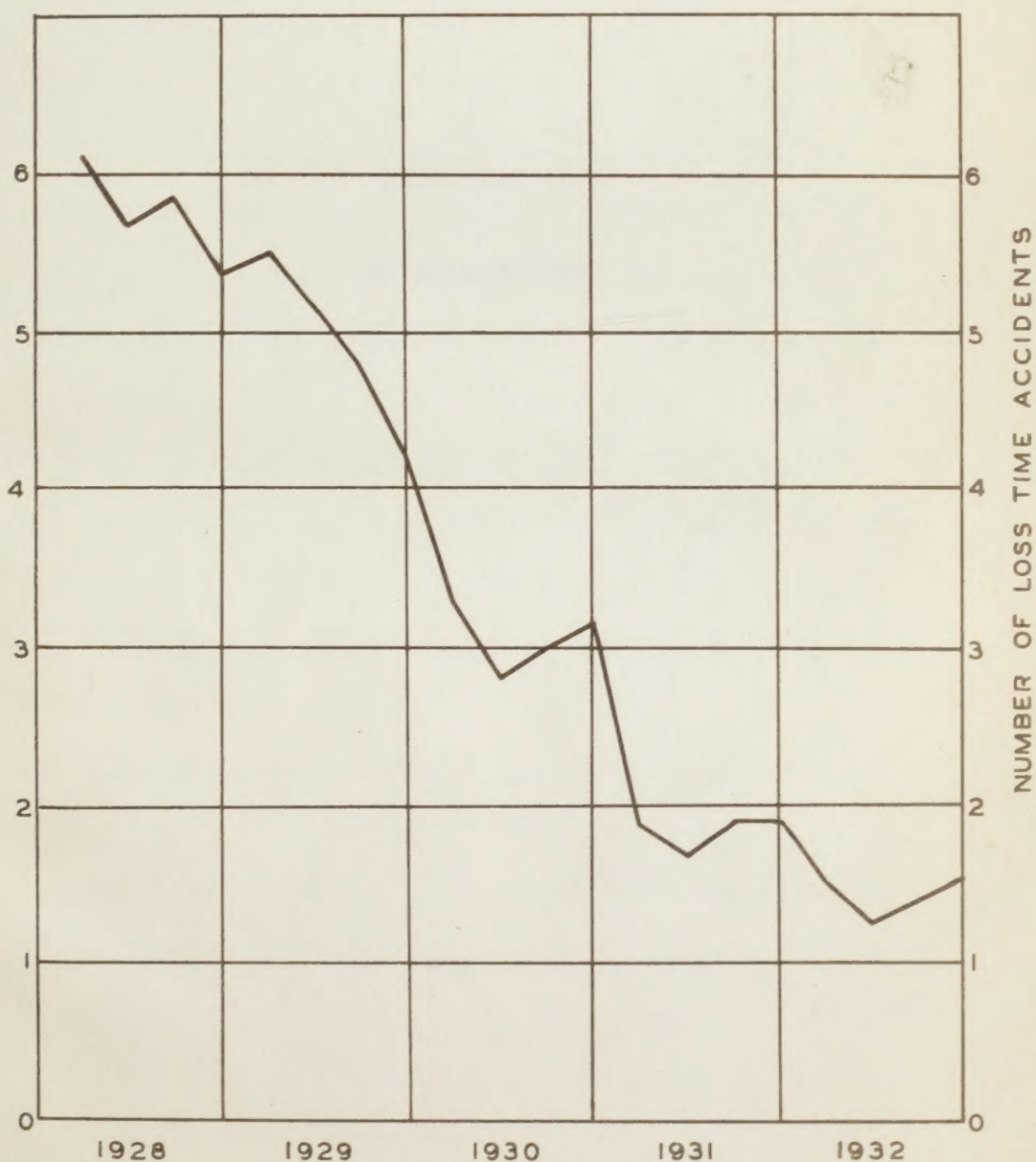


FIGURE 30











## CONCLUSION

The whole subject of Improving the Service of the Bell System Subscribers is one which must be viewed from many angles if the best results are to be obtained. Undoubtedly in the case of some features of telephone service, a greater improvement could be made by the expenditure of larger sums of money. Before adopting such methods, however, it is necessary to consider that in the final analysis the subscribers pay the bill and that less expensive methods should be adopted whenever possible.

In the case of toll service, for example, the speed of service could in many cases be improved appreciably by constructing a more extensive toll plant, and by having a greater number of direct circuits between all cities. This enormous expense would reduce the number of toll calls which must be routed through two or more switching points but the plan, under present circumstances, would hardly be justified when proper weight is given to the small percentage of calls which would be affected and to the probable revenues which would be derived from this additional plant.

Similarly in the case of plant repair and maintenance service, it might be possible to anticipate many of the station troubles by having all the telephone stations inspected once every year or two. But here again the costs would be out of proportion to the benefits derived and they might even require the subscribers to pay





higher rates.

In reviewing the reports of the different departmental conferences which have been held and of the annual reviews of departmental activities, one idea is consistently stressed, namely, that improvement has been made, but that further improvement is possible and necessary. Emphasis is also repeatedly laid on the need of looking for opportunities for "betterment of the service and of searching for ways and means of giving to the subscribers every attention that will enhance the dependability of the service and every attention that the subscriber may desire or consider to be his due".(183) This same thought has also been expressed in some of the Annual Reports of the Directors of the American Telephone and Telegraph Company to the Stockholders.

This was the principle which served as the keynote of President Gifford's address at Dallas, Texas, and which is the basis and purpose of all Bell System activities. By being constantly reminded of this purpose it is **not** surprising to find that each year the employees show a general improvement in the performance of the work over the preceeding year. This same ideal of service will continue to urge the management and personnel in the Bell System to show further improvements as long as there is some feature of service which is susceptible to improvement.

(183) Reference 56, page 11





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